MINNESOTA CODE OF AGENCY RULES

RULES OF THE DEPARTMENT OF ADMINISTRATION

1982 Reprint

All rules as in effect on September 15, 1982

Prepared by

THE OFFICE OF REVISOR OF STATUTES
Room 3, State Capitol, St. Paul, Minnesota 55155

Distributed by

STATE REGISTER AND PUBLIC DOCUMENTS DIVISION
DEPARTMENT OF ADMINISTRATION
117 University Avenue, St. Paul, Minnesota 55155

DEPARTMENT OF ADMINISTRATION

Chapter One: General

2 MCAR S 1.0001	Severability.
2 MCAR S 1.201	Scope and purpose.
2 MCAR S 1.202	Definitions.
2 MCAR S 1.203	Access to public data.
2 MCAR S 1.204	Access to private data.
2 MCAR S 1.205	Access to private data concerning data subjects who are minors.
2 MCAR S 1.206	Access to confidential data.
2 MCAR S 1.207	Access to summary data.
2 MCAR S 1.208	Classification of data.
2 MCAR S 1.209	Authority of the responsible authority.
2 MCAR S 1.210	Appointment of the responsible authority.
2 MCAR S 1.211	Appointment power of the responsible authority.
2 MCAR S 1.212	Duties of the responsible authority relating to public accountability.
2 MCAR S 1.213	Duties of the responsible authority relating to the administration of private and confidential data.
2 MCAR S 1.214	Duties of the responsible authority as they relate to the administration of all entity data.
2 MCAR S 1.215	Administrative appeal.
2 MCAR S 1.216	General powers of the commissioner.
2 MCAR S 1.217	Duties of the commissioner relating to temporary classification of data.
2 MCAR S 1.218	Severable provisions.
2 MCAR S 1.220	Forms.

Chapter Five: Intergovernmental Information Systems Advisory Council

2 MCAR S 1.2501	Purpose and scope.
2 MCAR S 1.2502	Definitions.
2 MCAR S 1.2503	Eligibility.
2 MCAR S 1.2504	Directions for submission of proposals.
2 MCAR S 1.2505	Acknowledgement of receipt.
2 MCAR S 1.2506	Oral presentations.
2 MCAR S 1.2507	Approval or disapproval of applications.
2 MCAR S 1.2508	Disclaimer.

Chapter Nine-A: Materials Management - Documents

2 MCAR S 1.3001	Authority and scope.
2 MCAR S 1.3002	Publications and maps availability.
2 MCAR S 1.3003	How to purchase available materials.
2 MCAR S 1.3004	Other services offered.
2 MCAR S 1.3005	Fees.
2 MCAR S 1.3006	Disclaimer of liability.

Chapter Nine-B: Federal Surplus Property

2 MCAR S 1.3101	Authority and scope.
2 MCAR S 1.3102	Definitions.
2 MCAR S 1.3103	Eligibility.
2 MCAR S 1.3104	Financing and service charge.
2 MCAR S 1.3105	Terms and conditions on donable property.
2 MCAR S 1.3106	Fair and equitable distribution.
2 MCAR S 1.3107	Compliance, utilization, and disposition.
2 MCAR S 1.3108	Property sales.
2 MCAR S 1.3109	Consultation with advisory groups -- public and private groups.

Chapter Nine-C: Office of the State Register

2 MCAR S 1.3201	Scope and purpose.
2 MCAR S 1.3202	Availability of the State Register publications.
2 MCAR S 1.3203	Fees.
2 MCAR S 1.3204	Disclaimer of liability.
2 MCAR S 1.3205	Errata listings.

Chapter Nine-D: State Surplus Property Sales

2 MCAR S 1.3301	Authority and scope.
2 MCAR S 1.3302	General terms and requirements of purchase.
2 MCAR S 1.3303	Auction sales.
2 MCAR S 1.3304	Sealed bid sales.
2 MCAR S 1.3305	Negotiated sales.
2 MCAR S 1.3306	Public employee purchase of state surplus property.

Chapter Ten: Central Motor Pool

2 MCAR S 1.3501	Scope and purpose.
2 MCAR S 1.3502	Insurance claim procedures.

Chapter Eleven: Plant Management

2 MCAR S 1.4001	Parking.
2 MCAR S 1.4101	Personal property lost on state property.
2 MCAR S 1.4201	Permits for public rallies in the capitol complex.

Chapter Twelve: Publications and General Services Division

2 MCAR S 1.4501	Purpose and scope.
2 MCAR S 1.4502	Definition of a "standard line" for legal notices.
2 MCAR S 1.4503	Evaluation and certification of line rates for legal notices.
2 MCAR S 1.4504	Fees for publication of legal notices.
2 MCAR S 1.4505	Controversy between publisher and public official.

Chapter Thirteen: Real Estate Management

2 MCAR S 1.5001	Property acquisition.
2 MCAR S 1.5101	Issuance of permits or easements across state lands.
2 MCAR S 1.5201	Permits to search for lost property.
2 MCAR S 1.5202	Terms and conditions.
2 MCAR S 1.5203	Application for permit.
2 MCAR S 1.5204	Granting of permits.
2 MCAR S 1.5205	Disposition of found property.
2 MCAR S 1.5301	Property leasing (where state is lessor).

Chapter Fifteen: Telecommunications

2 MCAR S 1.6001	Scope and purpose.
2 MCAR S 1.6002	Definitions.
2 MCAR S 1.6003	Application for sublease.
2 MCAR S 1.6004	Application approval.
2 MCAR S 1.6005	Fees and conditions.

Rules Governing Minimum Standards and Administration of Minnesota 911 Emergency Telephone Service (Minnesota Statutes, sections 403.01 to 403.12)

2 MCAR S 1.6101	Purpose of rules.
2 MCAR S 1.6102	Definitions.
2 MCAR S 1.6103	Establishment of county 911 planning committee.
2 MCAR S 1.6104	Submission of tentative plans.
2 MCAR S 1.6105	Submission of final plans.
2 MCAR S 1.6106	Certificate of plan approval.
2 MCAR S 1.6107	Resubmission of plans.
2 MCAR S 1.6108	Design standards.
2 MCAR S 1.6109	Operational requirements.
2 MCAR S 1.6110	Variance from design standards.
2 MCAR S 1.6111	Waivers from the requirements of Minnesota Statutes, sections 403.01-403.08.
2 MCAR S 1.6112	System contracts.
2 MCAR S 1.6113	Modification to plan.
2 MCAR S 1.6114	Funding eligibility-payment of recurring costs.
2 MCAR S 1.6115	Funding eligibility-payment of central office modification costs.

Chapter Sixteen: Procurement

2 MCAR S 1.6501	Scope and definitions.
2 MCAR S 1.6502	Method of bidding.
2 MCAR S 1.6503	Bid security.
2 MCAR S 1.6504	Opening of bids.
2 MCAR S 1.6505	Award.
2 MCAR S 1.6506	Tie bids.
2 MCAR S 1.6507	Contract performance.
2 MCAR S 1.6508	Failure to perform.
2 MCAR S 1.6509	Contract cancellation.
2 MCAR S 1.6510	Bidder errors.
2 MCAR S 1.6601	Sheltered workshop.
2 MCAR S 1.6701	Purpose, scope, definitions.
2 MCAR S 1.6702	Eligibility for set-aside program.
2 MCAR S 1.6703	Self-certification of eligibility.
2 MCAR S 1.6704	Establishment of set-aside procurements.
2 MCAR S 1.6705	General terms and conditions.
2 MCAR S 1.6801	State-funded partial indemnification of small businesses and small businesses owned by economically and socially disadvantaged persons.
2 MCAR S 1.6802	
2 MCAR S 1.6803	
2 MCAR S 1.6804	
2 MCAR S 1.90101	Authorization.
2 MCAR S 1.90102	Enforcement.
2 MCAR S 1.90103	Definitions.
2 MCAR S 1.90201	Requirement for seals, code compliance,

	construction compliance certificates, or labels.
2 MCAR S 1.90202	Acquisition of labels and seals; installer registration.
2 MCAR S 1.90204	Application for seals.
2 MCAR S 1.90205	Denial and repossession of seals.
2 MCAR S 1.90206	Seal or label removal.
2 MCAR S 1.90207	Placement of seals.
2 MCAR S 1.90208	Lost or damaged seals, construction.
2 MCAR S 1.90209	Return of seals.
2 MCAR S 1.90210	Compliance certificate.
2 MCAR S 1.90301	Plans required.
2 MCAR S 1.90302	Application for manufactured home accessory structure approval.
2 MCAR S 1.90303	Application for support and anchoring systems approval.
2 MCAR S 1.90305	Equipment and systems.
2 MCAR S 1.90307	Non-conforming plans, specifications and supporting data.
2 MCAR S 1.90308	Evidence of commissioner's approval.
2 MCAR S 1.90309	Support and anchoring systems approval expiration.
2 MCAR S 1.90310	Changes to approved support and anchoring systems.
2 MCAR S 1.90401	Inspection requests.
2 MCAR S 1.90402	Action after requested inspection.
2 MCAR S 1.90403	Other inspections.
2 MCAR S 1.90404	Notice of violations.
2 MCAR S 1.90450	Stabilizing systems for manufactured home installation.
2 MCAR S 1.90460	Utility connections.
2 MCAR S 1.90501	Procedure.
2 MCAR S 1.90601	Qualifications for approval.
2 MCAR S 1.90602	
2 MCAR S 1.90701	Construction alterations.
2 MCAR S 1.90702	Consumer complaint handling and remedial actions.
2 MCAR S 1.90703	Purpose.
2 MCAR S 1.90704	Scope.
2 MCAR S 1.90705	Consumer complaints.
2 MCAR S 1.90706	Notification and correction requirement.
2 MCAR S 1.90707	Consumer complaint and information referral.
2 MCAR S 1.90708	Notification pursuant to manufacturer's determination.
2 MCAR S 1.90709	Responsibilities of the commissioner.
2 MCAR S 1.90710	Required manufacturer correction.
2 MCAR S 1.90711	Notification and correction pursuant to administrative determination.
2 MCAR S 1.90712	Reimbursement for prior correction by owner.
2 MCAR S 1.90713	Manufacturer's plan for notification and correction.
2 MCAR S 1.90714	Contents of notice.
2 MCAR S 1.90715	Time for implementation.

2 MCAR S 1.90716 Completion of remedial actions and report.
2 MCAR S 1.90717 Correction of certain hazards and defects.
2 MCAR S 1.90718 Manufactured homes in the hands of dealers and distributors.
2 MCAR S 1.90719 Notices, bulletins, and other communications.
2 MCAR S 1.90720 Supervision of notification and correction actions.
2 MCAR S 1.90801 Reciprocity.
2 MCAR S 1.90802 Appeals.
2 MCAR S 1.90803 Hearings and presentation of views meetings.
2 MCAR S 1.90901 Form and remittance.
2 MCAR S 1.90902 Fees for seals, construction compliance certificates, and labels.
2 MCAR S 1.90903 Appeal fee.
2 MCAR S 1.90904 Annual registration fees.
2 MCAR S 1.90905 Other fees.
2 MCAR S 1.90906 Reservation of rights.

Chapter Three: State Building Code Division

2 MCAR S 1.10001 Purpose.
2 MCAR S 1.10002 Definitions.
2 MCAR S 1.10003 Code adoption and amendments.
2 MCAR S 1.10004 Application for appeal.
2 MCAR S 1.10005 State surcharge fees.
2 MCAR S 1.10006 State Building Code information and assistance.
2 MCAR S 1.10007 Education and training.
2 MCAR S 1.10008 Building official certification.
2 MCAR S 1.10009 Removal from office and revocation of certification.
2 MCAR S 1.10010 Plan review function.

Minnesota State Building Code

2 MCAR S 1.10101 Title, rules and regulations.
2 MCAR S 1.10102 Purpose and application.
2 MCAR S 1.10103 Definitions.
2 MCAR S 1.10104 Scope.
2 MCAR S 1.10105 Fallout shelters.
2 MCAR S 1.10106 State-owned buildings.
2 MCAR S 1.10107 State plan checking fees.
2 MCAR S 1.10108 Disclaimer clause.
2 MCAR S 1.10109 Appendices.
2 MCAR S 1.10111 Adoption of the Uniform Building Code by reference.
2 MCAR S 1.10112 Validity clause.

Minnesota Prefabricated Structures and Manufactured Buildings Code

2 MCAR S 1.10301	Title and Scope. Identification and title.
2 MCAR S 1.10302	Purpose.
2 MCAR S 1.10303	Definitions.
2 MCAR S 1.10304	Approval.
2 MCAR S 1.10305	Inspection.
2 MCAR S 1.10306	Certification.
2 MCAR S 1.10307	Reciprocity.
2 MCAR S 1.10308	Modification.
2 MCAR S 1.10309	Testing.
2 MCAR S 1.10310	Inspection.
2 MCAR S 1.10311	On-site inspection by local enforcement agency.
2 MCAR S 1.10312	Local zoning.
2 MCAR S 1.10313	Standards and requirements.
2 MCAR S 1.10314	Building permits.
2 MCAR S 1.10315	Certificate of occupancy.
2 MCAR S 1.10316	Changes to approved plans.
2 MCAR S 1.10317	Change of ownership, name or address.
2 MCAR S 1.10318	Change in the code.
2 MCAR S 1.10319	Non-compliance.
2 MCAR S 1.10320	Seals.
2 MCAR S 1.10321	Issuance.
2 MCAR S 1.10322	Reporting.
2 MCAR S 1.10323	Return of seals.
2 MCAR S 1.10324	Revocation.
2 MCAR S 1.10325	Manufacturer's data plate.
2 MCAR S 1.10326	Plan approval procedures.
2 MCAR S 1.10327	Products manufactured in more than one location.
2 MCAR S 1.10328	Non-conforming application and plans.
2 MCAR S 1.10329	Evidence of plan approval.
2 MCAR S 1.10330	Required construction details.
2 MCAR S 1.10331	General.
2 MCAR S 1.10332	Requirements for manufacturer.
2 MCAR S 1.10333	Inspection agencies' procedures for compliance assurance.
2 MCAR S 1.10334	Approval of inspection and evaluation agencies.
2 MCAR S 1.10335	Fees.
2 MCAR S 1.10336	Provisional authority.

State Building Code Chapter 55
Facilities for the Handicapped

2 MCAR S 1.15501 Where required.
2 MCAR S 1.15502 Building accessibility.
2 MCAR S 1.15503 Sanitation facilities.
2 MCAR S 1.15504 Other facilities.
2 MCAR S 1.15505 Viewing positions in assembly occupancies.
2 MCAR S 1.15506 Controls and electrical switches.
2 MCAR S 1.15507 Tactile identification.
2 MCAR S 1.15508 Figures.

Rules for Display of the Symbol of Accessibility

2 MCAR S 1.15530 Title and rules.
2 MCAR S 1.15531 Authorization and purpose.
2 MCAR S 1.15532 Scope.
2 MCAR S 1.15533 Enforcement.
2 MCAR S 1.15534 Definitions.
2 MCAR S 1.15535 Display of symbol.
2 MCAR S 1.15536 Appeals.
2 MCAR S 1.15537 Issuance.
2 MCAR S 1.15538 Placement of symbol.

Design and Evaluation Criteria for Energy Conservation in New Buildings, Additions, Remodeled Elements of Buildings and Standards for Certain Existing Public Buildings

2 MCAR S 1.16001 Authorization.
2 MCAR S 1.16002 Enforcement.
2 MCAR S 1.16003 Purpose.
2 MCAR S 1.16004 Scope.
2 MCAR S 1.16005 Adoption of ASHRAE Standard 90-75 by reference.
2 MCAR S 1.16006 Required procedure for exemption.

Standards of Performance for Solar Energy Systems and Subsystems Applied to Energy Needs of Buildings

2 MCAR S 1.16101 Purpose.
2 MCAR S 1.16102 Enforcement.
2 MCAR S 1.16103 Rules.
2 MCAR S 1.16104 Disclosure statement.
2 MCAR S 1.16105 Definitions.
2 MCAR S 1.16106 Standards for evaluation of solar energy systems.
2 MCAR S 1.16107 Standards for evaluation of solar subsystems.

Rules for Energy Conservation Standards for Existing Residences

2 MCAR S 1.16201	Authority.
2 MCAR S 1.16202	Enforcement.
2 MCAR S 1.16203	Purpose and scope.
2 MCAR S 1.16204	Definitions.
2 MCAR S 1.16205	Minimum energy efficiency standards.
2 MCAR S 1.16206	Procedures for calculating energy savings and determining economic feasibility.
2 MCAR S 1.16207	General energy savings equations.
2 MCAR S 1.16208	General payback equation.

Rules for Energy Disclosure Program and for Certification of Evaluators for the Energy Disclosure Program

2 MCAR S 1.16220	Authorization.
2 MCAR S 1.16221	Purpose and scope.
2 MCAR S 1.16222	Disclosure program.
2 MCAR S 1.16223	Certification.
2 MCAR S 1.16224	Standards for certification, prerequisites.
2 MCAR S 1.16225	Examinations.
2 MCAR S 1.16226	Bond required.
2 MCAR S 1.16227	Certification fees.
2 MCAR S 1.16228	Conflict of interest.
2 MCAR S 1.16229	Non-endorsement.
2 MCAR S 1.16230	Revocation.
2 MCAR S 1.18601	Electrical.
2 MCAR S 1.18701	Plumbing.
2 MCAR S 1.18801	Elevators, dumbwaiters, escalators, manlifts, moving walks, hoists and lifts.
2 MCAR S 1.18802	Definitions.
2 MCAR S 1.18803	Existing installations.
2 MCAR S 1.18804	Inspection, tests and approval.
2 MCAR S 1.18805	Accidents.
2 MCAR S 1.18806	Elevators, dumbwaiters, escalators and moving walks.
2 MCAR S 1.18807	Stage and orchestra lifts.
2 MCAR S 1.18808	Manlifts.
2 MCAR S 1.18809	Temporary interior and exterior hoists.
2 MCAR S 1.18810	Mechanical parking garage equipment.
2 MCAR S 1.18811	Standards for wheelchair elevating devices.
2 MCAR S 1.18812	Hoistways, hoistway enclosures.
2 MCAR S 1.18813	Machinery and equipment for the devices.
2 MCAR S 1.18901	Adoption of "Flood Proofing Regulations".

Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code

SBC 7101	Title and scope. Identification and title.
SBC 7102	Purpose.
SBC 7103	Scope.
SBC 7201	General regulations. Construction and interpretation.
SBC 7202	New buildings.
SBC 7203	Existing buildings.
SBC 7204	Change in use.
SBC 7205	Alternate equipment appurtenances, material and methods.
SBC 7206	Tests.
SBC 7207	Submittal and approval of plans.
SBC 7208	Safety hazard.
SBC 7209	Boiler and furnace equipment room size.
SBC 7301	Load calculations -- heating, cooling and ventilating.
SBC 7302	Definitions.
SBC 7303	Heat loss calculation.
SBC 7304	Internal heat source credits.
SBC 7305	Cooling loads: general.
SBC 7306	Cooling load calculations; commercial and public buildings.
SBC 7307	Design conditions; commercial and public buildings.
SBC 7308	Instantaneous heat load: commercial and public buildings.
SBC 7309	Cooling loads; residential.
SBC 7310	Cooling load calculations; residential.
SBC 7311	Total cooling load; residential.
SBC 7401	Chimneys -- gas vents -- connectors --(smoke pipes). General requirements.
SBC 7402	Definitions.
SBC 7403	Chimneys.
SBC 7404	Gas vents and flues, types and use.
SBC 7405	Outside gas vents and chimneys.
SBC 7406	Condensate drain.
SBC 7407	Vent connectors.
SBC 7408	Special venting arrangements.
SBC 7409	Chimney connectors (smoke pipes) for liquid and solid fuels.
SBC 7501	Warm air heating. General.
SBC 7502	Warm air heating systems.
SBC 7503	Definitions.
SBC 7504	Amount of air circulated.
SBC 7505	Duct design.
SBC 7506	Total resistance determined.
SBC 7507	Maximum allowable velocities.
SBC 7508	Dampers.
SBC 7509	Supply air registers.
SBC 7510	Return air registers.
SBC 7511	Construction of ducts.
SBC 7512	Underground duct construction and

	installation.
SBC 7513	Size of furnace.
SBC 7514	Gas, oil, electric or stoker fired furnaces.
SBC 7515	Furnace foundations.
SBC 7516	Smoke pipes.
SBC 7517	Basic controls.
SBC 7518	Noise elimination.
SBC 7519	Warm air furnace standards.
SBC 7601	Steam and liquid systems. Scope.
SBC 7602	Definitions.
SBC 7603	Boilers.
SBC 7604	System design.
SBC 7605	Manufacturer's recommendation.
SBC 7606	Material standards.
SBC 7607	Application of materials (accessible installation).
SBC 7608	Application of materials (inaccessible installations).
SBC 7609	Joints and connections.
SBC 7610	Underground.
SBC 7611	Isolation of major components.
SBC 7612	Pressure relief and safety valve.
SBC 7613	Blow off and drain piping.
SBC 7614	Controlling devices.
SBC 7615	Mixing of radiation.
SBC 7616	Low water cut-offs.
SBC 7617	Piping support.
SBC 7618	Expansion and contraction.
SBC 7619	Clearance of piping.
SBC 7620	Tee connection.
SBC 7621	Reducers.
SBC 7622	Water supply fill connections.
SBC 7623	Boiler foundations.
SBC 7624	Insulation of pipes.
SBC 7625	Hole cutting.
SBC 7626	Drainage.
SBC 7627	Steam systems. Scope.
SBC 7628	Classifications.
SBC 7629	Definitions.
SBC 7630	Boilers.
SBC 7631	Steam supply from high pressure boilers.
SBC 7632	Boiler connections.
SBC 7633	Boiler feed pumps, vacuum pumps and combinations.
SBC 7634	Stop valves and check valves.
SBC 7635	Strainers and drip pockets.
SBC 7636	Drips.
SBC 7637	Radiator connections.
SBC 7638	Hot water heating, chilled water cooling and liquid piping systems. Scope.
SBC 7639	Classifications.
SBC 7640	Definitions.
SBC 7641	Boilers.

SBC 7642	General system design.
SBC 7643	Expansion or compression tanks.
SBC 7644	Residential system design.
SBC 7645	Table No. 1 (Residential).
SBC 7646	Pitch and venting.
SBC 7647	Chilled water piping general.
SBC 7648	Air cushion tank.
SBC 7649	Snow melting. Scope.
SBC 7650	System design.
SBC 7651	Safety.
SBC 7652	Corrosion.
SBC 7653	Tag.
SBC 7654	Thermal stresses.
SBC 7655	Testing.
SBC 7656	Draining and venting.
SBC 7657	Steam systems.
SBC 7658	Joints.
SBC 7659	Freeze protection.
SBC 7660	Expansion tank.
SBC 7661	Thermal shock.
SBC 7701	Ventilation. Definitions.
SBC 7702	General requirements.
SBC 7703	Drawings, specifications, and data.
SBC 7704	Design requirements.
SBC 7705	Occupancy classification.
SBC 7706	General requirements for occupancies under (1) and (2) classifications.
SBC 7707	General requirements: places of assembly.
SBC 7708	General requirements: churches, etc.
SBC 7709	General requirements: motion picture booths.
SBC 7710	General requirements: schools.
SBC 7711	General requirements: laboratories, etc.
SBC 7712	General requirements: wardrobes and locker rooms, etc.
SBC 7713	General requirements: toilets, pools, etc.
SBC 7714	General requirements: commercial kitchens.
SBC 7715	Residential ventilation.
SBC 7716	Offices.
SBC 7717	Retail establishments.
SBC 7718	Garages and service stations.
SBC 7719	Penal institutions, etc.
SBC 7720	Hospitals and nursing homes.
SBC 7721	Outside ventilating fresh air intakes.
SBC 7722	Combustion air intakes.
SBC 7723	Air cleaning apparatus.
SBC 7724	Ducts for residential application.
SBC 7725	Ductwork for other than residential application.
SBC 7726	Underground duct construction and installation.
SBC 7727	Suspended ceiling plenum.
SBC 7728	Insulation of ducts.

SBC 7729	Separate vent ducts.
SBC 7730	Vent ducts, horizontal run.
SBC 7731	Vent ducts above roof.
SBC 7732	Relief vents.
SBC 7733	Volume dampers and deflectors.
SBC 7734	Outlets and returns.
SBC 7735	Paint spray areas.
SBC 7736	Fire dampers in ducts passing through fire separation.
SBC 7801	Refrigeration. General requirements.
SBC 7802	Limitation.
SBC 7803	Refrigerants, unauthorized use.
SBC 7804	Definitions.
SBC 7805	Building occupancy classification.
SBC 7806	Refrigerating system -- classification by type.
SBC 7806	Refrigerant classification.
SBC 7807	Requirements for institutional, public assembly, residential and commercial occupancies.
SBC 7808	Requirements for industrial occupancies.
SBC 7809	Installation requirements.
SBC 7810	Refrigerant piping, valves, fittings and related parts.
SBC 7811	Design and construction of equipment.
SBC 7812	Refrigerant-containing pressure vessels.
SBC 7813	Relief devices in general.
SBC 7814	Relief devices for pressure vessels.
SBC 7815	Field tests.
SBC 7816	Instructions.
SBC 7901	Gas burners. Definitions of gas burners.
SBC 7902	Approval of equipment.
SBC 7903	Installation requirements. General.
SBC 7904	Venting gas burners.
SBC 7905	Tests. Burner operation. Appliance performance.
SBC 8001	Gas piping. Approval of materials and appliances.
SBC 8002	Gas piping material, connection.
SBC 8003	Flexible gas tubing connections.
SBC 8004	New materials.
SBC 8005	Defective pipe and fittings.
SBC 8006	Construction and installation, generally.
SBC 8007	Piping supports.
SBC 8008	Outside exposed piping.
SBC 8009	Drips.
SBC 8010	Pipe threads.
SBC 8011	Bending prohibited.
SBC 8012	Joint compounds.
SBC 8013	Structure protection.
SBC 8014	Piping protection.
SBC 8015	Restricted pipe runs.
SBC 8016	Restrictions on concealed piping.
SBC 8017	Depth of piping outside underground.
SBC 8018	Piping underground outside.

SBC 8019	Meter location.
SBC 8020	Meter support.
SBC 8021	Meter room ventilation.
SBC 8022	Main gas supply shut-off.
SBC 8023	Gas valves.
SBC 8024	Electrical grounding.
SBC 8025	Gas pressure regulators.
SBC 8026	Size of piping to gas appliances.
SBC 8027	Gas consumption.
SBC 8028	Size of pipe.
SBC 8029	Test of piping.
SBC 8030	Leakage test after gas turn on.
SBC 8031	Purging.
SBC 8032	LP gas installations.
SBC 8033	General safety precautions.

Oil Burners

SBC 8101	Definitions.
SBC 8102	Approvals.
SBC 8103	Fuel oil.
SBC 8104	Tanks.
SBC 8105	Piping, controls, pump and valves.
SBC 8106	Installation of oil burners and oil burner equipment.
SBC 8107	Kerosene and oil stoves and portable kerosene heaters.
SBC 8108	Inspection and tests.
SBC 8201	Stoker and coal fired installations. Standards established.
SBC 8202	Stoker defined.
SBC 8203	Approval of stoker required.
SBC 8204	General installation requirements.
SBC 8205	Calculating heat loss.
SBC 8206	Non-automatic stokers restricted.
SBC 8207	Automatic controls.
SBC 8208	Stoker capacity, setting heights, combustion space.
SBC 8209	Electric wiring and equipment.
SBC 8210	Combustion air requirements.
SBC 8301	Electric space heating. Standards established.
SBC 8302	Equipment and installation requirements.
SBC 8303	Heat loss calculations.
SBC 8304	Electrical energy requirements for space heating.
SBC 8306	Other requirements.
SBC 8401	Fireplaces and incinerators. Factory built fireplaces.
SBC 8402	Factory built fireplace stoves.
SBC 8403	Masonry fireplaces.
SBC 8404	Chimneys and fireplaces.
SBC 8405	Incinerators.
SBC 8406	Clearance.
SBC 8407	Mounting.
SBC 8408	Draft hood prohibited.
SBC 8409	Vent connector clearance.
SBC 8410	Vent connector material.
SBC 8411	Chimneys.
SBC 8501	Fire control. General regulations.
SBC 8502	Fire control assemblies required.
SBC 8503	Fire dampers not required.
SBC 8504	Construction and installation of control assemblies.
SBC 8505	System controls required.

DEPARTMENT OF ADMINISTRATION

Chapter 1 General

§ **1.0001 Severability.** If any provision of these rules is held invalid, such invalidity shall not affect any other provisions of the rules which can be given effect without the invalid provision, and to this end, the provisions of these rules are declared to be severable.

2 MCAR S 1.201 Scope and purpose. These rules relate to and shall apply to the provisions of Minnesota Statutes, sections 15.1611 to 15.1699.

201-220

A. These rules shall apply to those governmental entities as defined by Minnesota Statutes, section 15.162, subdivisions 5, 7, and 8, which collect, create, use, store, and disseminate data on individuals as defined in Minnesota Statutes, section 15.162, subdivision 3.

1. These rules shall only apply to data on individuals, as defined by Minnesota Statutes, section 15.162, subdivision 3, which is created, collected, maintained, used or disseminated by governmental entities.

B. Nonprofit social service agencies meeting the requirements of Minnesota Statutes, section 15.162, subdivision 5 shall include, but are not limited to, agencies providing mental health, physical health, counseling and day-activities services.

1. These rules shall only apply in the instance where such an agency is required, by the terms of a written contract with a state agency, political subdivision, or statewide system to collect, create, store, use, or disseminate data on individuals.

2. In the event of such a contract, these rules shall only apply to the data on individuals that is actually generated by the social service agency because of the contract.

3. Any data generated by activities of the social service agency that are independent of the contractually based activities shall not be subject to these rules.

4. These rules shall not apply to personnel data maintained on employees of such social service agencies.

C. These rules shall not apply to any government data collected, created, used, stored, or disseminated which is not data on individuals as defined in Minnesota Statutes, section 15.162, subdivision 3, except these rules shall apply to summary data.

D. Nothing in these rules shall limit the discovery procedures available at law to any party in a civil or criminal action or administrative proceeding as described in the Minnesota Rules of Civil Procedure and the Minnesota Rules of Criminal Procedure as adopted by the Minnesota Supreme Court or in Minnesota Statutes and rules adopted thereunder.

E. Nothing in these rules shall restrict or limit the scope or operation of any judicial order or rule issued by a state or federal court.

1. In the event of the issuance of a subpoena duces tecum for any private or confidential data or a subpoena requiring any agent of an entity to testify concerning any private or confidential data, the court's attention shall be called, through the proper channels, to those statutory provisions, rules, or regulations which restrict the disclosure of such information.

F. Nothing in these rules shall be construed to diminish the rights conferred on subjects of data by Minnesota Statutes, section 15.165, or any other statute.

G. The purpose of these rules is to aid governmental entities in implementing and administering Minnesota Statutes, sections 15.1611 to 15.1699 as those sections relate to data on individuals. These rules are intended to guide entities so that while protection is given to individual privacy, neither necessary openness in government nor the orderly and efficient operation of government is curtailed.

201-220

2 MCAR S 1.202 Definitions. All terms shall have the meanings given them by Minnesota Statutes, section 15.162. Those terms and additional terms as used in these rules shall have the meanings as follows:

A. Act means Minnesota Statutes, sections 15.1611 to 15.1699, as amended, officially entitled the "Minnesota Government Data Practices Act."

B. Data means "data on individuals" as defined in Minnesota Statutes, section 15.162, subdivision 3 of the act, unless stated otherwise.

1. Data can be maintained in any form, including, but not limited to, paper records and files, microfilm, computer medium, or other processes.

2. The duration of the existence of data, including whether certain data is temporary rather than permanent, is not relevant to compliance with these rules.

3. All data, in whatever form it is maintained, is "data on individuals" if it can in any way identify any particular individual.

4. Code numbers, which are used to represent particular individuals, constitute "data on individuals" if a list or index of any type is available by which the code number can be cross referenced to a name or other unique personal identifier so that any individual's identity is revealed. Code numbers, lists of code numbers or data associated with code numbers may qualify for treatment as summary data, pursuant to 2 MCAR S 1.209.

a. Code number means the labeling or enumeration of data by use of a letter, number, or combination thereof, which

is used in place of an individual's name, including but not limited to index numbers, dummy numbers, SOUNDEX codes, and social security numbers.

5. Data is "data on individuals" if it identifies an individual in itself, or if it can be used in connection with other data elements to uniquely identify an individual. Such data shall include, but is not limited to, street addresses, job titles and so forth where the particular data could only describe or identify one individual.

C. Confidential data, as defined in Minnesota Statutes, section 15.162, subdivision 2a of the act, shall only include data which is expressly classified as confidential by either a state statute, including the provisions of Minnesota Statutes, section 15.1642 of the act, or federal law.

1. Data is confidential only if a state statute or federal law provides substantially that:

a. Certain data shall not be available either to the public or to the data subject; or

b. Certain data shall not be available to anyone for any reason except agencies which need the data for agency purposes.

c. Certain data shall be confidential if a state statute or federal law provides that the data may be shown to the data subject only at the discretion of the person holding the data, and if such state statute or federal law provides standards which limit the exercise of the discretion of the person maintaining the data.

2. Data is not confidential if:

a. A state statute or federal law provides that the data is confidential, but the context of the statute or federal law, in which the term confidential appears, reasonably indicates the data is accessible by the data subject, or if the data subject is given access to the data only upon the discretion of the person holding the data and the state statute or federal law does not provide any standards which limit the exercise of such discretion. In such cases, the proper classification of the data is private.

3. A state agency rule, an executive order, an administrative decision, or a local ordinance shall not classify data as "confidential," or use wording to make data inaccessible to the data subject unless there is a state statute or federal law as the basis for the classification.

D. Private data, as defined in Minnesota Statutes, section 15.162, subdivision 5a of the act, shall only include data which is expressly classified by either a state statute, including the provisions of Minnesota Statutes, section 15.1642 of the act, or

federal law.

1. Data is private if a state statute or federal law provides substantially that:

a. Certain data shall not be available to the public but shall be available to the subject of that data;

b. Certain data shall not be available to anyone, except the data subject or his designated representative such as an attorney;

c. Certain data shall be confidential and the person the data is about may view the data at reasonable times; or

d. Certain data shall be confidential and may be shown to the data subject at the discretion of the person holding the data. Such data shall be private if the state statute or federal law does not provide standards which limit the exercise of the discretion of the person maintaining the data.

e. Certain data is confidential, but the context of the statute or federal law in which the term confidential appears, reasonably indicates the data is accessible by the individual who is the subject of the data.

2. Data is not private if:

a. A federal agency rule provides substantially that as a part of its plan for implementation of a certain federal program, a state agency, statewide system, or political subdivision must provide for the confidentiality of data obtained from program subjects.

3. A state agency rule, an executive order, an administrative decision, or a local ordinance shall not classify data as "private," or use wording to make data inaccessible to the public unless there is a state statute or federal law as the basis for the classification.

E. Public data shall mean "data on individuals," which is not classified by state statute, including Minnesota Statutes, section 15.1642, or federal law as private or confidential data.

1. This rule shall not limit the ability of an entity to apply for temporary classifications of data pursuant to Minnesota Statutes, section 15.1642 of the act.

F. Designee shall have the meaning given that term by Minnesota Statutes, section 15.162, subdivision 10.

G. Entity means any governmental agency subject to the requirements of the act, including state agencies, political subdivisions, and statewide systems as those terms are defined in Minnesota Statutes, section 15.162 of the act.

1. State agency shall include any entity which is given power of statewide effect by statute or executive order.

2. Political subdivision shall include those local government entities which are given powers of less than statewide effect by statute or executive order.

3. Statewide systems shall include, but are not limited to, record keeping and data administering systems established by statute, federal law, administrative decision or agreement, or joint powers agreement.

a. Statewide systems shall include, but are not limited to, the Criminal Justice Information System administered by the Bureau of Criminal Apprehension, the Statewide Accounting System, and the various welfare systems primarily administered by the Department of Public Welfare.

H. Federal Law means United States Code, rules and regulations of federal agencies as published in the Code of Federal Regulations, and federal case law, including decisions of any court in the federal judicial system.

I. Individual means any living human being. Individual shall not include any fictional entity or business such as a corporation, association, partnership, or sole proprietorship even in those instances where the name of such an entity or business includes the name of a natural person.

J. Records Management Act means Minnesota Statutes, section 138.17.

K. Responsible authority means the individual in each entity who is designated or appointed pursuant to Minnesota Statutes, section 15.162, subdivision 6 of the act.

1. In state agencies, the responsible authority shall be as follows, unless otherwise provided by state law:

a. Departments: the commissioner of the department.

b. Constitutional offices: the constitutional officer.

c. University of Minnesota: the individual appointed by the Board of Regents.

d. All other state agencies: the chief executive officer, or if none, then an individual chosen by the agency's governing body.

2. In political subdivisions, the responsible authority shall be as follows, unless otherwise provided by state law:

a. Counties: each elected official of the county shall be the responsible authority for his respective office. An individual who is an employee of the county shall be

appointed by the county board to be the responsible authority for any data administered outside the offices of elected officials.

b. Cities: the city council shall appoint an individual who is an employee of the city.

c. School districts: the school board shall appoint an individual who is an employee of the school district.

d. Nonprofit corporations or nonprofit social service agencies: unless a statute or the governmental entity which created the corporation or agency appoints an individual, the governing body of the corporation or agency shall appoint an individual. If no appointment is made, the chief executive officer of the nonprofit corporation or agency shall be the responsible authority. If the corporation or agency is part of a statewide system, the responsible authority for the statewide system shall be the responsible authority for the corporation or agency as determined by this rule.

e. All other political subdivisions: the governing body shall appoint an individual who is an employee of the political subdivision.

3. In "statewide systems," the responsible authority shall be as follows, unless otherwise provided by state law:

a. The commissioner of any state department or any executive officer designated by statute or executive order as responsible for such a system; or

b. If a state statute or executive order does not designate an individual as responsible authority, the commissioner of administration shall appoint the responsible authority after the entities which participate in the system jointly apply for such an appointment in a form provided by the commissioner of administration.

L. Summary data, as defined in Minnesota Statutes, section 15.162, subdivision 9 of the act, means data which has been extracted, manipulated, or summarized from private or confidential data, and from which all data elements that could link the data to a specific individual have been removed.

1. Summary data includes, but is not limited to, statistical data, case studies, reports of incidents, and research reports.

2. Once it is summarized from private or confidential data, summary data remains summary if the responsible authority maintains any list of numbers or other data which could uniquely identify any individual in the summary data physically separated from the summary data and the responsible authority does not make such list or other data available to persons who gain access to, or possession of the summary data.

2 MCAR S 1.203 Access to public data. The responsible authority shall comply with the following general rules governing access to public data.

A. The responsible authority shall provide access to public data to any person, without regard to the nature of that person's interest in the data.

1. The responsible authority shall establish procedures to describe how such access may be gained. The procedures established shall be in compliance with Minnesota Statutes, section 15.1621 of the act.

a. In such procedures, the responsible authority may limit the time during which access to public data is available to the time during which the normal operations of the agency are conducted.

b. In such procedures, the responsible authority shall provide for a response to a request for access within a reasonable time.

c. The responsible authority may charge a reasonable fee for providing copies of public data.

d. In determining the amount of the reasonable fee, the responsible authority shall be guided by the following:

(1) The cost of materials, including paper, used to provide the copies.

(2) The cost of the labor required to prepare the copies.

(3) Any schedule of standard copying charges as established by the agency in its normal course of operations.

(4) Any special costs necessary to produce such copies from machine based record keeping systems, including but not limited to computers and microfilm systems.

(5) Mailing costs.

2 MCAR S 1.204 Access to private data. Pursuant to Minnesota Statutes, sections 15.163 and 15.162, subdivision 5a of the act, the responsible authority shall comply with the following rules concerning access to private data:

A. Access to private data shall be available only to the following:

1. Subject of such data, as limited by any applicable statute or federal law.

2. Individuals within the entity, whose work assignments reasonably require access.

3. Entities and agencies as determined by the responsible authority who are authorized by statute, including Minnesota Statutes, section 15.163, subdivision 4 of the act, or federal law to gain access to that specific data.

4. Entities or individuals given access by the express written direction of the data subject.

B. The responsible authority shall establish written procedures to assure that access is gained only by those parties identified in Part A of this rule.

1. In those procedures, the responsible authority shall provide for reasonable measures to assure, in those instances where an individual who seeks to gain access to private data asserts that he or she is the subject of that data or the authorized representative of the data subject, that the individual making the assertion is in fact the subject of the data or the authorized representative of the data subject.

2. Examples of such reasonable measures include, but are not limited to, the following:

a. Requiring the person seeking to gain access to appear at the offices of the entity to gain such access or, in lieu of a personal appearance, requiring the signature of any data subject who is unable to appear at the offices of the entity.

b. Requiring the person to provide reasonable identification.

C. The responsible authority may limit the time that access is available to the data subject to the normal working hours of the agency.

D. The responsible authority shall not charge the data subject any fee in those instances where the data subject only desires to view private data.

E. The responsible authority may charge the data subject a reasonable fee for providing copies of private data.

1. In determining the amount of the reasonable fee, the responsible authority shall be guided by the criteria set out in 2 MCAR S 1.203 concerning access to public data.

2 MCAR S 1.205 Access to private data concerning data subjects who are minors. Pursuant to Minnesota Statutes, sections 15.162, subdivisions 4 and 5a, and 15.163 of the act, the responsible authority shall comply with the following rules concerning access:

A. In addition to the particular requirements of this rule, access to private data concerning a minor data subject shall be subject to the requirements of 2 MCAR S 1.204 concerning access to all private data.

B. Access to private data concerning minors shall be available only to the following:

1. Those parties identified as having access to private data under section A of 2 MCAR S 1.204.

2. Subject to the provisions of Minnesota Statutes, section 15.162, subdivision 4, any other applicable statute, and the exception set out at 2 MCAR S 1.205, C.1. below, the parents of the minor data subject.

a. For purposes of this rule, the responsible authority shall presume the parent has the authority to exercise the rights inherent in the act unless the responsible authority has been provided with evidence that there is a state law or court order governing such matters as divorce, separation, or custody, or a legally binding instrument which provides to the contrary.

C. Pursuant to the provisions of Minnesota Statutes, section 15.162, subdivision 4, the responsible authority shall establish procedures to provide access by the parents of a minor data subject to private data concerning that minor, subject to the following:

1. The responsible authority may deny parental access to private data when the minor, who is the subject of that data, requests that the responsible authority deny such access.

a. The responsible authority shall provide minors from whom the entity collects private or confidential data with a notification that the minor individual has the right to request that parental access to private data be denied.

b. The responsible authority may require the minor data subject to submit a written request that the data be withheld. The written request shall set forth the reasons for denying parental access and shall be signed by the minor.

2. Upon receipt of such a request, the responsible authority shall determine if honoring the request to deny parental access would be in the best interest of the minor data subject.

a. In making the determination, the responsible authority shall be guided by at least the following:

(1) Whether the minor is of sufficient age and maturity to be able to explain the reasons for and to understand the consequences of the request to deny access.

(2) Whether the personal situation of the minor is such that denying parental access may protect the minor data subject from physical or emotional harm.

(3) Whether there is ground for believing that the minor data subject's reasons for precluding parental access are reasonably accurate.

(4) Whether the data in question is of such a nature that disclosure of it to the parent could lead to physical or emotional harm to the minor data subject.

(5) Whether the data concerns medical, dental, or other health services provided pursuant to Minnesota Statutes, sections 144.34 to 144.347. If so, the data may be released only if failure to inform the parent would seriously jeopardize the health of the minor.

3. The responsible authority shall not deny access by parents to data that is considered an "education record," as that term is defined in Title 45 Code of Federal Regulations, part 99, section 99.3, unless the minor to whom the data pertains is enrolled as a full time student in a post-secondary educational institution or the student has attained the age 18. As of the date of the adoption of these rules, the term "education records" was defined by Title 45 Code of Federal Regulations, part 99, section 99.3 as follows: "'Education Records' (a) Means those records which: (1) Are directly related to a student, and (2) are maintained by an educational agency or institution or by a party acting for the agency or institution. (b) The term does not include: (1) Records of instructional, supervisory, and administrative personnel and educational personnel ancillary thereto which: (i) Are in the sole possession of the maker thereof, and (ii) Are not accessible or revealed to any other individual except a substitute. For the purpose of this definition, a "substitute" means an individual who performs on a temporary basis the duties of the individual who made the record, and does not refer to an individual who permanently succeeds the maker of the record in his or her position. (2) Records of a law enforcement unit of an educational agency or institution which are: (i) Maintained apart from the records described in paragraph (a) of this definition; (ii) Maintained solely for law enforcement purposes, and (iii) Not disclosed to individuals other than law enforcement officials of the same jurisdiction; Provided. That education records maintained by the educational agency or institution are not disclosed to the personnel of the law enforcement unit. (3) (i) Records relating to an individual who is employed by an educational agency or institution which; (A) Are made and maintained in the normal course of business: (B) Relate exclusively to the individual in that individual's capacity as an employee, and (C) Are not available for use for any other purpose. (ii) This paragraph does not apply to records relating to an individual in attendance at the agency or institution who is employed as a result of his or her status as a student. (4) Records relating to an eligible student which

are: (i) Created or maintained by a physician, psychiatrist, psychologist, or other recognized professional or paraprofessional acting in his or her professional or paraprofessional capacity, or assisting in that capacity; (ii) Created, maintained, or used only in connection with the provision of treatment to the student, and (iii) Not disclosed to anyone other than individuals providing the treatment; Provided. That the records can be personally reviewed by a physician or other appropriate professional of the student's choice. For the purpose of this definition, "treatment" does not include remedial educational activities or activities which are part of the program of instruction at the educational agency or institution. (5) Records of an educational agency or institution which contain only information relating to a person after that person was no longer a student at the educational agency or institution. An example would be information collected by an educational agency or institution pertaining to the accomplishments of its alumni."

4. Without a request from a minor, the responsible authority may deny parental access to private data on a minor, pursuant to the provisions of Minnesota Statutes, section 144.335 or any other statute or federal law that allows or requires the responsible authority the authority to do so, if such state statute or federal law provides standards which limit the exercise of the discretion of the responsible authority.

2 MCAR S 1.206 Access to confidential data. Pursuant to Minnesota Statutes, sections 15.163 and 15.162, subdivision 2a, the responsible authority shall comply with the following rules concerning access to confidential data:

A. Access to confidential data is available only to the following:

1. Individuals within the entity, whose work assignments reasonably require access.

2. Entities and agencies who are authorized by statute, including Minnesota Statutes, section 15.163 of the act, or federal law to gain access to that specific data.

B. The responsible authority shall establish written procedures to assure that access may be gained only by those parties identified in Part A of this rule.

1. In the drafting and administration of those procedures, the responsible authority shall provide measures by which data subjects or their authorized representatives shall be informed, upon request, if they are the subjects of confidential data.

a. The responsible authority shall not disclose the actual confidential data to the data subjects, but shall inform them whether confidential data concerning them is or is not

retained.

b. The responsible authority shall take reasonable measures to assure that the person making inquiry is actually the individual data subject or the authorized representative of the data subject.

c. Reasonable measures include, but are not limited to:

(1) Requiring the inquiring person to appear at the office of the entity to make his/her request;

(2) Requiring the inquiring person to provide identification; or

(3) Requiring the notarized signature of any data subject who is unable to appear at the offices of the entity.

2 MCAR S 1.207 Access to summary data. Pursuant to Minnesota Statutes, section 15.163, subdivision 7, the responsible authority shall comply with the following general rules concerning access to summary data:

A. Summary data is public-data, unless classified by statute, federal law or temporary classification as not public. The responsible authority shall comply with 2 MCAR S 1.203, concerning access to public data.

B. The responsible authority shall prepare and implement procedures in his/her agency to assure that access to summary data is provided pursuant to Minnesota Statutes, section 15.163, subdivision 7 of the act. In the preparation and administration of such procedures, the responsible authority shall comply with the following:

1. Preparation of summary data may be requested by any person. The request shall be in writing in a form provided by the responsible authority. Within ten days of the receipt of such a request, the responsible authority shall inform the requestor of the estimated costs if any, pursuant to section 2 of this rule and subject to the provisions of that section either:

a. Provide the summary data requested; or

b. Provide a written statement to the requestor, describing a time schedule for preparing the requested summary data, including reasons for any time delays; or

c. Provide access to the requestor to the private or confidential data for the purpose of the requestor's preparation of summary data, pursuant to Minnesota Statutes, section 15.163, subdivision 7, of the act and subdivision 4 of this section; or

d. Provide a written statement to the requestor

stating reasons why the responsible authority has determined that the requestor's access would compromise the private or confidential data.

2. Any costs incurred in the preparation of summary data shall be borne by the requesting person. In assessing the costs associated with the preparation of summary data, the responsible authority shall:

a. Be guided by the provisions of 2 MCAR S 1.203 in determining costs.

b. Provide to the requesting person an estimate of the costs associated with the preparation of the summary data.

c. Prior to preparing or supplying the summary data, collect any funds necessary to reimburse the entity for its costs.

d. Charge no more than reasonable copying costs when the summary data being requested requires only copying and no other preparation.

e. Take into account the reasonable value to the entity of the summary data prepared and where appropriate reduce the costs assessed to the requesting person.

3. For the purposes of administering Minnesota Statutes, section 15.163, subdivision 7, the following terms shall have the meanings given them.

a. "Administrative officer" includes, but is not limited to, the entity's research director, statistician, or computer center director.

b. "Person outside" the entity includes the person requesting the summary data or any other person designated by the person requesting the data.

4. A non-disclosure agreement, as required by Minnesota Statutes, section 15.163, subdivision 7 of the act shall contain at least the following:

a. A general description of the private or confidential data which is being used to prepare summary data.

b. The purpose for which the summary data is being prepared.

c. A statement that the preparer understands he/she may be subject to the civil or criminal penalty provisions of the act in the event that the private or confidential data is disclosed.

5. Methods of preparing summary data include but are not limited to the following:

a. Removing from a set of data, a file, or a record keeping system all unique personal identifiers so that the data that remains fulfills the definition of summary data as defined by Minnesota Statutes, section 15.162, subdivision 9 of the act.

b. Removing from the entity's report of any incident, or from any collection of data similar to an incident report, all unique personal identifiers so that the resulting report fulfills the definition of summary data in Minnesota Statutes, section 15.162, subdivision 9 of the act.

c. For the purpose of this rule, "removing all unique personal identifiers" includes but is not limited to:

(1) Blacking out personal identifiers on paper records.

(2) Tearing off or cutting out the portions of paper records that contain the personal identifiers.

(3) Programming computers in such a way that printed, terminal or other forms of output do not contain personal identifiers.

2 MCAR S 1.208 Classification of data. In order to comply with the provisions of Minnesota Statutes, sections 15.162, 15.165 and 15.163 of the act the responsible authority shall:

A. Review and identify all of the types of data maintained by the entity, including data retained as active and inactive.

B. Determine what types of data maintained by the entity are classified as private or confidential, according to the definitions of those terms pursuant to Minnesota Statutes, section 15.162 of the act and 2 MCAR S 1.202.

C. Identify either a state statute or provisions of federal law supporting any determination that certain data is either private or confidential.

D. Administer all agency data in accordance with the determinations made under 2 MCAR S 1.210 B.

2 MCAR S 1.209 Authority of the responsible authority. Pursuant to Minnesota Statutes, sections 15.162 through 15.1642 of the act, the responsible authority shall have the authority to:

A. Implement the act and these rules in each entity.

B. Make good faith attempts to resolve all administrative controversies arising from the entity's practices of creation, collection, use and dissemination of data.

C. Prescribe changes to the administration of the entity's

programs, procedures, and design of forms to bring those activities into compliance with the act and with these rules.

D. Take all administrative actions necessary to comply with the general requirements of the act, particularly Minnesota Statutes, section 15.165, and these rules.

E. Where necessary, direct designees to perform the detailed requirements of the act and these rules under the general supervision of the responsible authority.

2 MCAR S 1.210 Appointment of the responsible authority.

A. Pursuant to Minnesota Statutes, section 15.162, subdivision 6 of the act, the governing body of each political subdivision and the governing body of each state agency whose activities are subject to the direction of a governing body shall, within 30 days of the effective date of these rules, if it has not done so, appoint a responsible authority.

1. This rule shall not affect the appointments of responsible authorities made previous to the adoption of this rule.

2. The governing body shall confer on the responsible authority full administrative authority to carry out the duties assigned by the act and by these rules.

3. Governing bodies may use the forms set forth in the appendix to these rules to appoint the responsible authority.

2 MCAR S 1.211 Appointment power of the responsible authority. Pursuant to Minnesota Statutes, section 15.1621, subdivision 2 of the act, the responsible authority shall, if he deems it to be in the best interest of the administration and enforcement of the act, appoint designees who shall be members of the staff of the entity. In the exercise of this appointment power, the responsible authority shall comply with the following:

A. The appointment order shall be in writing and copies of the order constitute public data on individuals, pursuant to Minnesota Statutes, section 15.162, subdivision 5, clause (b) of the act.

B. The responsible authority shall instruct any designees in the requirement of the act and of these rules. If the responsible authority deems it necessary, such instruction shall include:

1. Distribution to designees of written materials describing the requirements of the act and of these rules.

2. Preparation of training programs whose objective is to familiarize agency personnel with the requirements of the act

and of these rules.

3. Requiring attendance of designees and other entity personnel at training programs held within or outside the entity.

2 MCAR S 1.212 Duties of the responsible authority relating to public accountability. Pursuant to Minnesota Statutes, section 15.163 of the act, the duties of the responsible authority shall include, but not be limited to the following:

A. For the purposes of public accountability, the responsible authority shall, within 60 days of the effective date of these rules, or until August 1 of each year when the requirements of Part B of this rule are fully complied with, place his/her name, job title and business address, and the name(s) and job titles of any designees selected by the responsible authority on a document.

1. Such document shall be made available to the public and/or posted in a conspicuous place by each entity.

2. The document shall identify the responsible authority or designees as the persons responsible for answering inquiries from the public concerning the provisions of the act or of these rules.

B. In the public document to be prepared or updated by August 1 of each year as required by Minnesota Statutes, section 15.163 of the act, the responsible authority shall identify and describe by type all records, files, or processes maintained by his/her entity, which contain private or confidential data.

1. In addition to the items to be placed in the public document as required by Minnesota Statutes, section 15.163 of the act, the responsible authority shall include the following:

a. The name, title, and address of designees appointed by the responsible authority.

b. Identification of the files or systems for which each designee is responsible.

c. A citation of the state statute or federal law which classifies each type of data as private or confidential.

2. The responsible authority shall draft the descriptions of the types of records, files, and processes in easily understandable English. Technical or uncommon expressions, understandable only by a minority of the general public shall be avoided, except where required by the subject matter.

3. The responsible authority may use the form set forth in the appendix to these rules to prepare this public document.

2 MCAR S 1.213 Duties of the responsible authority relating to the administration of private and confidential data. In order to administer the requirements of Minnesota Statutes, section 15.163, subdivision 4 of the act, the responsible authority shall determine for each type of record, file, or process identified in 2 MCAR S 1.214 whether the data contained therein was collected prior or on or subsequent to August 1, 1975.

A. For each type of record, file or process containing data collected prior to August 1, 1975, the responsible authority shall:

1. Review the federal, state or local legal enabling authority which mandated or necessitated the collection of the private or confidential data.

2. Based on that review, determine the lawful purpose for the collection of the data at the time it was originally collected.

3. Direct the staff of the entity that private or confidential data collected prior to August 1, 1975, shall not be used, stored, or disseminated for any purpose, unless that purpose was authorized by the enabling authority which was in effect at the time the data was originally collected.

B. For each type of record, file, or process containing private or confidential data collected on or subsequent to August 1, 1975, the responsible authority shall:

1. Review the legal enabling authority which mandates or necessitates the collection of the data.

2. Identify the purposes for the collection of and the intended uses of all private or confidential data that have been communicated to data subjects or should have been communicated to data subjects at the time of data collection, pursuant to Minnesota Statutes, section 15.165, subdivision 2 of the act.

C. Using the purposes and uses identified in Parts A and B of this rule, the responsible authority shall:

1. Prepare lists which identify the uses of and purposes for the collection of private or confidential data for each type of record, file or process identified in 2 MCAR S 1.214.

a. Each list shall identify all persons, agencies, or entities authorized by state or federal law to receive any data disseminated from the particular record, file or process.

2. Pursuant to Minnesota Statutes, section 15.165, subdivision 2 of the act, either:

a. Attach each list identifying purposes, uses and recipients of data to all agency forms which collect the private or confidential data that will be retained in each record, file

or process; or

b. Communicate, in any reasonable fashion, the contents of each list to data subjects at the time particular data that will be retained in each record, file, or process is collected from them. For purposes of this section, "reasonable fashion" shall include, but not be limited to:

(1) Oral communications made to data subjects.

(2) Providing data subjects with brochures that describe the entity's purposes for the collection of and the uses to be made of private and confidential data.

D. In administering the entity's private or confidential data consistent with the provisions of these rules, the responsible authority shall:

1. Educate entity personnel as to authorized purposes and uses.

2. Prepare administrative procedures that will acquaint entity personnel with authorized purposes and uses.

3. Distribute policy directives requiring compliance with the entity's determination of authorized purposes and uses.

E. The responsible authority shall authorize a new purpose for the collection of private or confidential data or a new use for private or confidential data under any one of the following conditions:

1. If subsequent passage of federal or state legislation requires initiation of a new or different purpose or use pursuant to Minnesota Statutes, section 15.163, subdivision 4, clause (b), of the act, or

2. The responsible authority, prior to initiation of the new or different purpose or use, complies with the provisions of either Minnesota Statutes, section 15.163, subdivision 4, clause (a), subdivision 4, clause (c) or subdivision 4, clause (d) of the act.

a. For the purposes of administration of Minnesota Statutes, section 15.163, subdivision 4, clause (a) or subdivision 4, clause (c), the responsible authority shall file a statement in a form prescribed by the commissioner.

b. For the purposes of Minnesota Statutes, section 15.163, subdivision 4, clause (d) the following term shall have the meaning given it:

(1) "Informed consent" means the data subject possesses and exercises sufficient mental capacity to make a decision which reflects an appreciation of the consequences of allowing the entity to initiate a new purpose or use of the data

in question.

c. For the purposes of the administration of Minnesota Statutes, section 15.163, subdivision 4, clause (d), the responsible authority shall comply with the following:

(1) The responsible authority shall not take any action to coerce any data subject to give an "informed consent." The responsible authority shall explain the necessity for or consequences of the new or different purpose or use.

(2) All informed consents shall be given in writing. Prior to any signature being affixed to it by the data subject, such writing shall identify the consequences of the giving of informed consent.

(3) If the responsible authority makes reasonable efforts to obtain the informed consent of a data subject and if those efforts are not acknowledged in any way, the responsible authority shall interpret the silence of the data subject as the giving of an implied consent to the new or different purpose or use of the data.

(a) For purposes of this section, "reasonable efforts" shall include:

(i) Depositing in the United States mail, postage pre-paid and directed to the last known address of the data subject, at least two communications requesting informed consent.

(ii) Waiting for a period of not less than 60 days for a response to the second request.

(4) The data subject may give informed consent to less than all of the data elements in any list of data elements presented by a responsible authority, thereby giving only partial consent.

(a) Only those elements that the data subject has expressly consented to shall become part of the new or different purpose or use.

D. If the responsible authority seeks an individual's informed consent to the release of private data to an insurer or the authorized representative of an insurer, the responsible authority shall comply with the provisions of Minnesota Statutes, section 15.163, subdivision 4, clause (d), (1) through (7).

2 MCAR S 1.214 Duties of the responsible authority as they relate to the administration of all entity data. Pursuant to Minnesota Statutes, section 15.163, subdivision 3 of the act, the responsible authority shall, within 18 months of the effective date of these rules, formulate a plan that will

provide for the review and analysis of the data administration practices of the entity.

A. In the formulation of this plan, the responsible authority shall at least provide for the preparation of a list of or index to all data or types of data currently collected, stored, used, or disseminated by the entity.

1. The list or index developed shall include the identification of the state statute(s), federal law(s), or local ordinance(s) that authorize(s) the programs or functions for which data or types of data are collected, or which authorize(s) the actual collection, storage, use or dissemination of data or types of data.

a. The plan shall further provide for the list or index to be updated when new or different data collection, storage, use or dissemination is authorized.

b. This list or index shall be available to members of the general public, upon request.

B. The responsible authority shall use this plan and the list or index developed to aid in the determination of whether collection and storage of data and use and dissemination of private or confidential data is necessary.

1. For purposes of this section, data is necessary if:

a. The particular data is both:

(1) Required to carry out programs and functions that are expressly or impliedly authorized by a provision of state statute, federal law or a local ordinance; and

(2) Periodically examined, updated, modified or referred to by the entity; or

b. The entity would be unable to fulfill its duties without undue or increased burden or expense, if the particular data were not collected, stored, used or disseminated; or

c. Retention of the particular data is required in the event that a legal action is brought against or by the entity; or

d. Retention of the particular data is essential to comply with a state or federal requirement that data be retained for a specified period for the purposes of auditing, records retention, historical interest, and other similar purposes.

C. For any data determined to be not necessary pursuant to Part B of this rule, the responsible authority shall provide for the following activities in the entity's plan.

1. Taking all actions, including modification of the

entity's data collection forms and data collection procedures, to assure that all unnecessary data is no longer collected and stored and all private and confidential data determined to be not necessary is no longer used and disseminated. Private data shall continue to be disseminated upon request by the data subject.

2. Disposing of data determined to be not necessary pursuant to the procedures of the Records Management Act.

a. Inquiries concerning procedures for disposition of data may be directed to the Records Management Division, Department of Administration, St. Paul, Minnesota, 55155.

D. In the formulation of the plan described in section A of this rule, the responsible authority shall provide for the establishment of administrative mechanisms and procedures that comply with Minnesota Statutes, section 15.163, subdivision 5 of the act. For purposes of this section,

1. "Accurate" means that the data in question is reasonably correct and free from error.

2. "Complete" means that the data in question reasonably reflects the history of an individual's transactions with the particular entity. Omissions in an individual's history that place the individual in a false light shall not be permitted.

3. "Current" means that the data in question must be logically related to the entity's required and actual use of the data in its day-to-day operations.

2 MCAR S 1.215 Administrative appeal. Pursuant to Minnesota Statutes, section 15.165, subdivision 4 of the act, an individual may appeal an adverse determination of a responsible authority to the commissioner of administration.

A. The appeal shall follow the procedures established in Minnesota Statutes, chapter 15, as amended, and the rules of the Office of Administrative Hearings relating to contested case proceedings.

B. Notice of an appeal must be submitted to the commissioner within a reasonable time of the determination made by the responsible authority pursuant to Minnesota Statutes, section 15.165, subdivision 4 of the act. For purposes of this section, "reasonable time" shall mean 180 days unless the responsible authority has provided the individual with a written statement which informs the individual of the right to appeal the determination to the commisssoner. In the event this statement is provided, "reasonable time" for purposes of this section shall mean 60 days.

1. The notice shall be in writing and addressed to the Commissioner of Administration, State of Minnesota, 50 Sherburne

Avenue, St. Paul, Minnesota 55155.

2. The notice shall contain the following information:

a. The name, address, and phone number, if any, of the appealing party.

b. The name of the responsible authority and the entity which he or she represents.

c. A description of the nature of the dispute, including a description of the data.

d. A description of the desired result of the appeal.

3. Upon written request of the data subject stating reasons, the appeal may be processed under the name of a pseudonym.

C. The hearing examiner, at any stage of the proceedings, after all parties have had an opportunity to present their views, may recommend dismissal of any sham, capricious, or frivolous case, or any case not within the jurisdiction of the Department of Administration.

D. The Department of Administration shall be reimbursed for all costs associated with the contested case proceeding by the entity whose responsible authority has been the impetus for the individual's appeal to the commissioner.

1. The commissioner shall establish appropriate accounting procedures to provide to the entity an itemized invoice.

2 MCAR S 1.216 General powers of the commissioner. Pursuant to Minnesota Statutes, section 15.163, subdivision 2 of the act and to assist in the general implementation and enforcement of the act, the commisssoner shall have the following powers:

A. If the commissioner determines that certain information is relevant to monitoring any entity's data collection and handling practices, policies and procedures, the commissioner shall require the responsible authority of such entity to submit the information.

B. Any inquiries concerning the act or these rules and any information submissions required to be made by section A of this rule shall be directed to the Data Privacy Division, Department of Administration, State of Minnesota, 50 Sherburne Avenue, St. Paul, Minnesota 55155.

C. The data privacy division shall respond promptly to all inquiries within personnel and budgetary limitations.

2 MCAR S 1.217 Duties of the commissioner relating to temporary classification of data. Pursuant to Minnesota Statutes, section 15.1642, the commissioner and responsible authorities shall comply with the following:

A. The responsible authority, pursuant to Minnesota Statutes, section 15.162, subdivision 6 of the act, shall prepare any application for temporary classification in writing in a form provided by the commissioner. Copies of the form are available from the data privacy division.

B. For the purposes of the administration of Minnesota Statutes, section 15.1642 of the act, the following terms have the meanings given to them:

1. "Days" means calendar, not working days.

2. "Upon filing" means upon receipt of either an original or amended application by the commissioner.

3. "Date of disapproval" means the date the responsible authority actually receives the disapproval notification from the commissioner.

4. "Within 25 days of submission to the attorney general" means within 25 days of the date that the Attorney General's Office in the Department of Administration actually receives the record from the commissioner.

C. Applications for temporary classification of data shall be submitted to the Data Privacy Division, Department of Administration, State of Minnesota, St. Paul, Minnesota 55155.

D. If the data privacy division requires the responsible authority to submit additional information in support of the application, that application is deemed to have been filed on the date the additional material is received by the data privacy division. The commissioner shall return any application to the applicant if the additional information requested is not received within 30 days.

2 MCAR S 1.218 Severable provisions. If any provisions of these rules are found invalid for any reason, the remaining provisions shall remain valid.

201
220

ADVISORY FORM A

RESOLUTION APPOINTING A COUNTY RESPONSIBLE AUTHORITY

State of Minnesota

County of (name of county)

WHEREAS, Minnesota Statutes, Section 15.162, Subdivision 6, requires that (name of county) County appoint one person as the Responsible Authority to administer the requirements for collection, storage, use and dissemination of data on individuals within the county and,

WHEREAS, the (name of county) County Board of Commissioners shares the concern expressed by the legislature on the responsible use of all County data and wishes to satisfy this concern by immediately appointing an administratively and technically qualified Responsible Authority as required under the statute.

BE IT RESOLVED, the County Board of Commissioners appoints (name of individual) as the Responsible Authority for the purpose of meeting all requirements of Minnesota Statutes, Sections 15.162 through 15.169, as amended, and with rules as lawfully promulgated by the Commissioner of Administration as published in the State Register on (insert appropriate date).

ADOPTED BY (name of county) COUNTY COMMISSIONERS ON (date).

ATTESTED TO: (signature of appropriate official)

(title of appropriate official)

ADVISORY FORM B

201-220

RESOLUTION APPOINTING A CITY RESPONSIBLE AUTHORITY

State of Minnesota

City of (insert name of city)

Resolution Title: Appointment of Responsible Authority

WHEREAS, Minnesota Statutes, Section 15.162, Subdivision 6, as amended, requires that the City of (insert name of city) appoint one person as the Responsible Authority to administer the requirements for collection, storage, use and dissemination of data on individuals, within the City and,

WHEREAS, the (insert name of city) City Council shares concern expressed by the legislature on the responsible use of all City data and wishes to satisfy this concern by immediately appointing an administratively qualified Responsible Authority as required under the statute.

BE IT RESOLVED, the City Council of (insert name of city) appoints (name of individual appointed) as the Responsible Authority for the purposes of meeting all requirements of Minnesota Statutes, Section 15.162 through 15.169, as amended, and with rules as lawfully promulgated by the Commissioner of Administration as published in the State Register on (insert appropriate date).

ADOPTED BY (insert name of city) CITY COUNCIL ON (date).

ATTESTED TO BY THE:

(Signature of Mayor) on (date)

(Signature of City Clerk) (date)

201
220

ADVISORY FORM C

RESOLUTION APPOINTING A SCHOOL DISTRICT RESPONSIBLE AUTHORITY

State of Minnesota

(name of district) School District

School District Number ____

Pursuant to the provisions of Minnesota Statutes, Section 15.162, Subdivision 6, as amended, (Insert name of individual), is hereby appointed Responsible Authority for the (insert name of district) School District Number ____.

(insert name of individual appointed) is hereby authorized to take all actions necessary to assure that all programs, administrative procedures and forms used within School District (insert number) are administered in compliance with the provisions of Minnesota Statutes, Sections 15.162 through 15.169, as amended, and with rules as lawfully promulgated by the Commissioner of Administration as published in the State Register on (insert appropriate date).

ADVISORY FORM D

201-220

RESOLUTION APPOINTING A RESPONSIBLE AUTHORITY FOR STATE OR LOCAL BOARDS OR COMMISSIONS

State of Minnesota

(insert name of board or commission)

Under the provisions of Minnesota Statutes, Section 15.162, Subdivision 6, as amended, (name of individual is hereby appointed Responsible Authority for (insert name of board or commission).

(insert name of individual appointed is hereby authorized to take all actions necessary to assure that all programs, administrative procedures and forms used by the (insert name of board or commission are administered in compliance with the provisions of Minnesota Statutes, Sections 15.162 through 15.169, as amended, and with rules as lawfully promulgated by the Commissioner of Administration and published in the State Register on (insert date.

ADVISORY FORM E

PUBLIC DOCUMENT AS REQUIRED BY MINNESOTA STATUTES, SECTION 15.163

GOVERNMENTAL ENTITY: (Name of Entity) (Address)

RESPONSIBLE AUTHORITY: (Name) (Title) (Address)

NAME OF RECORD, FILE, SYSTEM OR PROCESS (Insert a name sufficient to identify.)	DESCRIPTION OF RECORD, FILE, SYSTEM OR PROCESS (Describe in terms understandable by the general public.)	CLASSIFICATION (Insert private or confidential.)	CITATION OF STATUTE OR FEDERAL LAW THAT CLASSIFIES THE DATA (Insert citation to state or federal statute, federal rule, case law)	NAME, TITLE AND ADDRESS OF DESIGNEE, IF ANY FOR FILE, ETC. (Insert name, etc. of person appointed to be in charge of this file,etc.

201
220

Chapter 5 Intergovernmental Information Systems Advisory Council

§ 1.2501 Purpose and scope. Pursuant to Minn. Stat. §§ 16.90 and 16.911, these rules govern the application, solicitation, review, analysis, and final disposition of grant proposals received by the Intergovernmental Information Systems Advisory Council for possible funding of projects or programs under the auspices of the Commissioner of Administration relating to data processing and systems analysis proposals.

§ 1.2502 Definitions. For the purposes of 2 MCAR §§ 1.2501-1.2508, the following terms have the meanings given:

A. "Commissioner" means Commissioner of Administration.

B. "IISAC" or "Council" means the Intergovernmental Information Systems Advisory Council.

C. "Executive Director" or "Director" means the Executive Director of IISAC.

§ 1.2503 Eligibility. All Minnesota governmental entities and/or organizations composed of groups of such entities are eligible to submit applications for project grants to IISAC. Information as to the availability of funding and conditions of funding may be obtained from the Executive Director, Intergovernmental Information Systems Advisory Council, 300 Hanover Building, 480 Cedar Street, St. Paul, Minnesota 55101.

§ 1.2504 Directions for submission of proposals.

A. Applications shall be submitted in writing to the Executive Director, Intergovernmental Information Systems Advisory Council, 300 Hanover Building, 480 Cedar Street, St. Paul, Minnesota 55101, in accordance with the following procedures.

1. All proposals shall be typed on letter sized paper (8½ x 11).

2. Pages shall be numbered for ease of reference.

3. Twenty-five copies of each proposal shall be submitted with the application.

4. The proposals shall follow the proposal format as described in paragraph B. of this rule.

5. All proposals shall identify the name, title, address, and telephone number of the person who will represent the eligible agency on matters regarding the proposal content.

6. No standard forms are required.

7. The Commissioner or Executive Director may require other information relevant to processing an application.

B. Proposal format:

1. a cover sheet stating:

a. title of the proposal;

b. the agency submitting the proposal;

c. names, address, and telephone number of agency and project director.

2. a narrative section describing the overall background of the organization, its mission, goals, objectives, whom it services, and its relationship to state agencies and political subdivisions;

3. a section containing a clear, concise explanation of the purpose of the proposal;

4. a section containing a narrative which details and expands on the purpose of the proposal;

5. a section itemizing tasks to be performed and deliverable products resulting from the proposal;

6. a budget section itemizing expenses and showing matching contributions if applicable;

7. a section containing a time schedule relating to the tasks to be accomplished and deliverable products;

8. a section containing pertinent enclosures and endorsements relating to support of the application.

§ 1.2505 Acknowledgement of receipt. All applicants shall be notified of formal receipt of applications. Such notification shall include:

1. date of distribution to Council members;

2. date of Council meeting at which the application will be reviewed;

3. notification of completeness of application or requests for additional information.

§ 1.2506 Oral presentations. Oral presentations or testimony may be requested by the Council to clarify or further explain portions of the proposal. Such presentations or testimony shall be requested in writing by the Director.

§ 1.2507 Approval or disapproval of applications.

A. Council approval or disapproval of recommendations for funding shall be made by a majority vote of those members present at a regular meeting of the Council. The recommendations shall be based on a consideration of the following factors:

1. available funding;

2. potential technological advancements;

3. cost-benefit relationship;

4. transferability of anticipated technological advancements to other potential users;

5. applicant's experience and expertise in the field of data processing and system analysis;

6. applicant's financial need.

B. Recommendations shall be forwarded to the Commissioner for his or her approval. The Commissioner's approval shall be contingent upon his or her consideration of the above factors and the determination that the proposal is consistent with state information systems priorities. The Commissioner shall notify the Council which shall in turn notify all applicants as to action taken on applications.

§ 1.2508 Disclaimer. The submission of a proposal or application to the Intergovernmental Information Systems Advisory Council does not commit the Council to fund the proposal or to pay for any cost incurred by the applicant in the development or presentation of the proposal.

Chapter 9A Materials Management—Documents

§ 1.3001 Authority and scope. These rules are promulgated pursuant to Minn. Stat. §§ 16.02, subds. 17 and 24; 16.026; 16.80; and 16.811, to inform the general public of the availability of publications, maps and other services from the Documents Section, Materials Management Division, Department of Administration. All references to "Commissioner" refer to the Commissioner of Administration. All references to "Documents Section" refer to the Documents Section, Department of Administration, 140 Centennial Bldg., 658 Cedar St., St. Paul, Minnesota 55155.

§ 1.3002 Publications and maps availability.

A. Authorization of publications. All publications and maps authorized by the commissioner shall be made available to the general public for fees set pursuant to 2 MCAR § 1.3005.

1. Information about publications or maps currently available may be obtained by writing the Documents Section at the above-noted address or by calling the Documents Section and requesting a catalog or map index.

B. Catalogs of publications and maps. The Documents Section shall publish a catalog of Minnesota State publications and indices of maps at intervals deemed necessary by the Commissioner, to keep the public reasonably informed of all materials currently available from the Documents Section.

1. Catalogs shall list current publications, their prices and code numbers including but not limited to the following publications: statutes, directories, conservation books, miscellaneous reports, teaching guides, and adopted rules of state agencies.

2. Indices for lake and fire plan maps list the name and code number of the lake, township and range for fire plan maps, and the prices for each.

3. Catalogs and indices are available from the Documents Section. There shall be no charge for catalogs and indices.

§ 1.3003 How to purchase available materials.

A. Over-the-counter sales. Any person may purchase any publication or map offered for sale from the section by paying the prescribed fee, plus sales tax, at the office of the Documents Section at the above-noted address during regular business hours.

B. Mail order instructions. Mail orders shall be sent to Documents Section, Room 140 Centennial Bldg., 658 Cedar St., St. Paul, Minnesota 55155. No forms are required.

1. Mail orders shall include a check or money order for the exact amount of purchase, including sales tax where applicable. If tax exemption is claimed, the tax exempt number shall be given.

2. Mail orders shall include the full title of the publication and code number, if possible.

3. Mail orders for lake maps shall include name of the lake and, where known, the code number. If the code number is unknown, the county, township, range and other specific information that will aid in locating the exact area shall be provided. All orders for fire plan maps shall be placed by listing township and range numbers of the area. A free index containing information including township and range numbers may be obtained from the Documents Section at the address contained in paragraph B. above.

4. Mail orders shall include the full name and address, including the zip code, of the person to whom the order is to be sent.

C. Customer deposit. Payment received for publications or maps that are temporarily out of stock or in short supply shall be held in "Customer Deposit." The customer shall be notified of the customer deposit number, and the item(s) will be shipped when available. The customer may request a refund of the amount held for each customer in the customer deposit on receipt of the notification. Requests for refund or inquiries regarding customer deposits shall be made to the Documents Section at the address contained in paragraph B. above.

Unused money in customer deposit shall be refunded at the end of each quarter of the fiscal year unless the customer requests it to be held for future use.

§ 1.3004 Other services offered. Subscription services, photocopying white printer reproductions, and other related services shall be offered to state agencies and the general public upon authorization by the commissioner.

§ 1.3005 Fees. Fees for services shall be prescribed by the commissioner unless otherwise authorized by law or rule and shall take into consideration the following factors: cost of publication, storage, handling, and the operating expenses of the Documents Section. Fee schedules shown in catalogs and indices are subject to change without notice.

§ 1.3006 Disclaimer of liability. The Documents Section of the Department of Administration shall assume no responsibility for or liability arising from contents of publications or maps distributed, produced, or otherwise made available under its auspices. Any concern or conflict arising from contents shall be referred to the state agency from which the copy for the publication or map emanated.

Chapter 9B Federal Surplus Property

§ 1.3101 Authority and scope. The Federal Surplus Property Section of the Materials Management Division, Department of Administration, was created and operates pursuant to Minn. Stat. §§ 16.061-16.066. The Federal Surplus Property Section maintains a distribution center for federal surplus property made available by the federal government, or any department or agency thereof, for transfer to governmental or non-profit organizations for any purpose authorized by federal and state law and in accordance with any rules and regulations promulgated thereunder.

§ 1.3102 Definitions. As used in 2 MCAR §§ 1.3101-1.3109, the following terms shall have the meaning given them.

A. "Acquisition Cost" means original purchase price of property paid by the Federal Government.

B. "Donee" means public agency or non-governmental organization qualified or authorized to acquire federal surplus property as provided in 2 MCAR § 1.3103.

C. "FPMR" means Federal Property Management Regulations.

D. "FSP Activity" means the Minnesota Federal Surplus Property Section, 5420 Highway 8, Arden Hills, Minnesota 55112.

E. "Utilization Restriction" means restrictions on the use and disposition of federal surplus property, including required use for one or more public purposes and non-disposal restrictions for stated period of time, as required pursuant to federal and state law, and rules and regulations promulgated pursuant thereto.

F. "Federal Surplus Property Utilization and Sales Coordinator" means FSP Activity person designated to audit the utilization of federal surplus property acquired by donees and to coordinate sales of property that has no further utility value.

G. "General Services Administration" means the federal agency responsible for the transfer of Federal Surplus Personal Property.

§ 1.3103 Eligibility.

A. Standards and guidelines for the determination of eligibility are established pursuant to the requirements of FPMR 101-44.207. Eligibility to acquire federal surplus property may include public agencies involved in carrying out or promoting for the residents of a given political area one or more public purposes, including, but not limited to, conservation, economic development, education, parks and recreation, public health, and public safety; or to non-profit educational or public health institutions or organizations, such as medical institutions, hospitals, clinics, health centers, schools, col-

leges, universities, schools for the mentally retarded, schools for the physically handicapped, child care centers, radio and television stations licensed by the Federal Communications Commission as educational radio or educational television stations, museums attended by the public, and libraries serving free all residents of a community, district, state, or region, which are exempt from taxation under section 501 of the Internal Revenue Code of 1954, as amended, for purposes of education or health, including research for any such purpose. Interested participants shall request on forms obtainable for the FSP Activity, a determination of eligibility from the FSP Activity at the address listed in 2 MCAR § 1.3102 D.

B. The FSP Activity within a reasonable period of time of receipt of request shall make a written determination of eligibility pursuant to federal and state laws and rules, and such determination shall be sent to the applicant.

§ 1.3104 Financing and service charge.

A. A revolving fund, established pursuant to Minn. Stat. § 16.064, shall finance the acquisition, storage and distribution of surplus federal property. The fund shall be maintained by the collection of service and handling charges.

B. Service charges shall be assessed at a rate taking into consideration costs involved in acquiring, storing, and distributing surplus property as required by Minn. Stat. § 16.064. Factors considered in determining service charges shall be original acquisition costs, present value, screening cost, quantity, condition, desirability of property, transportation cost, loading and unloading cost, packing and crating, administrative cost, repair and rehabilitation, utilization and compliance, and delivery to donees when required.

C. When special or extraordinary costs occur, such costs will be added to the service charge. Costs which shall be added are as follows.

1. Rehabilitated property. Direct costs for rehabilitating property shall be added to the service charge.

2. Overseas property. Additional direct costs for returning the property may be added to the service charge.

3. Long-haul property. Charges for major items with unusual costs may be added to the service charge.

4. Special handling. An additional charge may be made for dismantling, packing, crating, shipping, delivery, and other extraordinary handling charges.

5. Screening. Extraordinary costs incurred in screening property may be added.

D. Where direct transfer of property to eligible donee is made, the service

charge may be reduced taking into consideration savings made because of direct shipment to donee or other savings in the above-listed cost categories.

E. In the event the program is terminated, assets shall be converted to cash in accordance with these rules and all funds not used to pay outstanding obligations of the FSP Activity shall revert to the general fund of the State of Minnesota.

§ 1.3105 Terms and conditions on donable property.

A. The following general conditions, in conjunction with conditions imposed by the terms of an individual sale of items, are imposed by the State of Minnesota and are applicable to items with a unit acquisition cost of $2,000 or more:

1. There shall be a period of utilization restriction which shall expire after the property has been used for the purpose for which acquired for a period of 4 years, except that all State of Minnesota agencies shall be required to manage federal surplus property in accordance with statewide inventory management programs.

2. From the date it receives the property, the donee shall not sell, trade, lease, lend, bail, cannibalize, encumber or otherwise dispose of such property or remove it permanently for use outside the state, without prior written approval of the FSP Activity, until expiration of all utilization restrictions.

3. If at any time from the date it receives the property until expiration of utilization restrictions, any of the property is no longer suitable, useable, or further needed by the donee, the donee shall promptly notify, in writing, the FSP Activity and shall be directed, in writing, by the FSP Activity to return the property to the FSP Activity, release the property to another donee or another state agency, sell or otherwise dispose of the property.

4. In the event that any property acquired through the FSP Activity is sold, traded, leased, loaned, bailed, cannibalized, encumbered or otherwise disposed of contrary to state or federal law or regulation, relating but not limited to the General Services Administration special handling or use regulations, the donee shall pay the FSP Activity the proceeds of the disposal or the fair market value or the fair rental value of the property at the time of such disposal as determined by the FSP Activity. "Fair Market Value" and "Fair Rental Value" as used herein shall mean the value of obtaining a like item in the local industrial, retail, or other market.

5. The proceeds from any authorized sale or transfer shall be reimbursed pursuant to 2 MCAR § 1.3108 A.

B. The following conditions are imposed by the State of Minnesota, applicable to items with a unit acquisition cost of less than $2,000:

1. Appropriate inventory controls shall be established by each donee to ensure optimum property utilization and control in conformance with federal and state law and rule.

2. Except as listed in 2. a., property with acquisition cost of less than $2,000 which is no longer needed or suitable for use in the federal surplus program may be sold or junked by the donee possessing such property, consistent with any laws and internal policies and procedures governing such disposition. Donees shall be authorized to retain all revenues derived from such sale of surplus property, assuming that all aforementioned criteria have been met.

a. Consistent with federal statutory requirements, all property must be placed in use within one year and be used for one year after being placed in use. Donees in violation of this requirement shall return such property to the FSP Activity.

C. Failure to comply with all terms, conditions and provisions of state and federal law and regulation may subject donee to removal from FSP eligibility.

§ 1.3106 Fair and equitable distribution.

A. Factors considered in the distribution of property are based on relative needs, relative resources and ability to utilize the property and include the following:

1. Relative needs. In considering requests of potential recipients, the criteria for determining the relative needs shall be:

a. size and type of program conducted;

b. contemplated use and frequency of use;

c. economic condition of agency, activity or institution;

d. critical or urgent need;

e. geographical location (urban, suburban or rural);

f. interest and expression of need on the part of the donee in the property available.

2. Relative resources. In considering requests of potential recipients, the criteria for determining relative resources shall be:

a. funding source and availability (grants, donations, taxes, etc.);

b. equipment availability.

3. Ability to utilize. In considering requests of potential recipients, the criteria for evaluating ability to utilize property shall be:

a. length of time of contemplated usage;

b. date by which item can be put in use;

c. availability of funds to repair or maintain property in use;

d. ability of the donee to select and remove property from the distribution center or federal activity on a timely basis;

e. type and quantity of property received by the donee to date.

B. The FSP Activity shall operate a distribution center to serve the eligible donees in the distribution of available property. Any donee may submit, in writing, a list of major items needed by the donee, such as vehicles, construction equipment, materials handling equipment, machine tools, generators, air compressors, business machines, boats, aircraft, large electronic and scientific type items. FSP employees shall be guided by these requests in their search for and selection of property. This equipment shall be distributed as outlined in Section A. above. Donee shall be notified by telephone by the FSP Activity when a listed major item is acquired.

C. Small miscellaneous items, less than $20.00 per item in value, will be available on the "Help Yourself Plan", with quantity limited to any one donee depending upon the total quantity on hand.

D. Federal surplus property bulletins listing property available for distribution shall be mailed to all donees registered pursuant to 2 MCAR § 1.3103.

E. The FSP Activity shall recommend to General Services Administration the certification of donee screeners, as qualified and needed.

The FSP Activity will, insofar as practical, economical, and equitable select that property requested by the donees, and the FSP Activity will arrange for direct pickup or shipment of the property to the donee if requested to do so.

F. Donees which suffer or experience a local disaster and/or major loss of property due to fire, flood, tornado, etc., may apply for a temporary priority for all requested items of property by telephoning the FSP Activity or writing the FSP Activity at the address noted in 2 MCAR § 1.3102 D. Special efforts shall be made to locate and distribute needed property to such donees.

§ 1.3107 Compliance, utilization, and disposition.

A. In order to obtain optimum federal surplus property utilization within Minnesota, obsolete and surplus property liability and utilization procedures have been established for statewide application. In order to ensure the integrity of the statewide property utilization program, donee field audits shall be periodically conducted by the FSP Activity of the Materials Management Division. All donees shall cooperate with auditors and all audit requests or be subject to removal from FSP eligibility.

B. When property becomes obsolete or surplus to a donee's needs, it shall be reported to the FSP Activity on forms provided by the FSP Activity, as required in 2 MCAR § 1.3108 A.

C. Property reported as obsolete or surplus by donee on forms provided by the FSP Activity shall be evaluated by the Federal Surplus Property Utilization and Sales Coordinator to determine the most feasible means of disposition. If the property is considered to have further utility value within the utilization restriction period, this information shall be circulated to all donees via the Federal Surplus Property Bulletin, published periodically, and made available pursuant to 2 MCAR § 1.3106 D.

§ 1.3108 Property sales.

A. General.

1. All obsolete, surplus and recyclable personal property, which no longer provides any utility value to the Federal Surplus Property program, shall be sold. Local sale of personal property may be authorized, in writing, by the FSP Activity or sales shall be conducted centrally by the State Surplus Property Sales Section pursuant to 2 MCAR §§ 1.3301-1.3306.

2. Personal Property Sales may be transacted via the sealed bid process, public auction or on a negotiated basis. All local personal property sales shall be authorized in writing, by the FSP Activity, Division of Materials Management. Application forms for local sale shall be provided by the FSP Activity.

3. The FSP Activity shall determine the maximum amount of reimbursement allowed the donee selling the property pursuant to 2 MCAR § 1.3105, A. 5. Any revenue from such sale in excess of the authorized reimbursement amount, shall be submitted to the FSP Activity, accompanied by a copy of the forms required by the FSP Activity for reporting disposition results, a buyer acknowledged (signed) copy of the sales receipt, and a copy of the donee deposit form. Reimbursement to donee shall be on a prorated basis for the following expenses:

a. service charge paid to the FSP Activity;

b. transportation charges paid by the donee in initially acquiring the property;

c. initial costs of repair required to make the items useable; and

d. administrative costs incurred in the sale or transfer of such property.

B. Sealed bid sales.

1. Locally authorized bid sales may be used by all donees in the sealed

bid sale of federal surplus property when authorized, in writing, by the FSP Activity pursuant to 2 MCAR § 1.3108 A. 1.

2. Whenever practicable, at least three competitive bids shall be solicited in the sale of federal surplus personal property via the sealed bid process.

3. Sealed bid sales which are not authorized locally shall be processed by the FSP Activity pursuant to 2 MCAR § 1.3304.

4. Any employee directly involved in the sales process shall not be eligible to purchase surplus property for which they have specific responsibility.

C. Auction sales.

1. The FSP Activity shall coordinate all federal surplus personal property auction sales for all donees of the state.

2. When a donee has reported property, pursuant to 2 MCAR § 1.3108 A. 1., to the FSP Activity, which cannot be transferred to another donee, the FSP Activity shall determine the most effective means of disposal. If an auction sale is warranted, the auction sale shall be processed pursuant to 2 MCAR § 1.3303.

D. Negotiated sales.

1. Pursuant to Minn. Stat. § 16.07, subd. 4, sale of Federal Surplus personal property estimated to be $5,000 or less may be made either upon competitive bids or in the open market. All negotiated sales shall receive prior approval, in writing, from the FSP Activity.

2. Whenever practicable, at least three competitive bids shall be solicited in the sale of Federal surplus personal property via the negotiated process.

3. No employee of any donee organization may purchase Federal surplus property via the negotiated sale process.

4. The disposition of all negotiated sales shall be reported to the FSP Activity on the form provided by the FSP Activity, accompanied by a buyer acknowledged (signed) sales receipt and a copy of the donee deposit form.

5. A copy of the buyer acknowledged signed sales receipt shall be maintained in the donee(s) files for seven years from the date the sales transaction was consummated.

§ 1.3109 Consultation with advisory groups—public and private groups.

A. The FSP Activity shall consult with advisory bodies and public and private groups which can assist in determining relative needs and resources.

B. A private or public body wishing to be a party to the above consultation, shall, in writing, contact the FSP Activity Manager, 5420 Highway 8, Arden Hills, Minnesota 55112.

Chapter 9C Office of the State Register

§ 1.3201 Scope and purpose. These rules are promulgated pursuant to Minn. Stat. §§ 15.041-15.051 and govern the availability of publications from the Office of the State Register, Materials Management Division, Department of Administration. The Office of the State Register publishes and offers for sale the following:

1. the *State Register;*

2. the *Minnesota Guidebook to State Agency Services;*

3. the *Minnesota Code of Agency Rules* (MCAR).

§ 1.3202 Availability of the State Register publications.

A. Publications of the Office of the State Register are available from the Office of the State Register, Suite 415, Hamm Building, 408 St. Peter Street, St. Paul, Minnesota 55102. All purchases from the Office of the State Register shall be prepaid and may be obtained as described below.

B. *State Register.*

1. The *State Register* is distributed weekly on Monday to the public when published, either as a part of an annual subscription or in single copies for a fee set pursuant to 2 MCAR § 1.3203.

2. Mail orders for annual subscriptions shall be accompanied by the order form found on the back page of each issue of the *State Register* or on an order card available from the Office of the State Register and shall be accompanied by full payment.

3. Checks shall be made payable to the "Minnesota State Treasurer."

4. Single issue orders shall be accompanied by full payment.

5. Over-the-counter sales are available at the Office of the State Register at the address noted in section A. above.

6. Subscribers to the *State Register* shall receive a *Minnesota Guidebook* without additional charge.

C. *Minnesota Guidebook to State Agency Services.*

1. The *Guidebook* is made available to the public either as part of the annual *State Register* subscription or in response to requests from non-subscribers. The *Guidebook* is also available at retail bookstores throughout the state. Retail bookstores interested in distributing the *Guidebook* may contact the Office of the *State Register* at the address noted in section A. above.

2. Mail orders for the *Guidebook* shall be made on the order form found in the back page of each issue of the *State Register*. The order form is also available by phone or written request from the Office of the State Register.

3. Subscribers to the *State Register* shall receive a *Guidebook* without additional charge.

4. Orders for the *Guidebook* shall be accompanied by full payment. Checks shall be made payable to the "Minnesota State Treasurer."

D. *Minnesota Code of Agency Rules* (MCAR).

1. The MCAR, consisting of a multivolume set of permanent rules of state agencies, is made available to the public for a fee set pursuant to 2 MCAR § 1.3203. A quarterly update service is available for an additional fee.

2. All orders shall be placed in writing or in person at the Office of the State Register at the address noted in section A. above.

E. Finality of sales. All purchases from the Office of the State Register shall be final.

§ 1.3203 Fees. Fees for services shall be prescribed by the Commissioner of Administration and approved by the Commissioner of Finance unless otherwise authorized by law or rule and shall be based upon the following factors: cost of publication, storage, handling, postage and operating expenses of the Office of the State Register. Fees may differ for quantity purchases.

§ 1.3204 Disclaimer of liability. The Office of the State Register of the Department of Administration shall assume no responsibility for or liability arising from the contents of publications distributed, printed, or otherwise available under its auspices. Any conflict arising from contents shall be referred to the state agency from which the copy or information for the publication emanated.

§ 1.3205 Errata listings. Omission or other errors in copy shall be corrected by errata listings so identified in subsequent issues.

Chapter 9D State Surplus Property Sales

§ 1.3301 Authority and scope. Pursuant to Minn. Stat. §§ 16.02, 16.07, 16.08, 16.24 and 16.28, the State Surplus Property Sales Section, Division of Materials Management, Department of Administration, is responsible for managing a statewide surplus property sales program in order to ensure the effective ultimate disposition of all surplus personal property. These rules govern the disposition of all such obsolete, surplus and recyclable state property. Sales are conducted via public auction, sealed bid or negotiation, as set forth below.

§ 1.3302 General terms and requirements of purchase.

A. Waiver of warranty. The State of Minnesota shall make no warranty as to the fitness, merchantability or other condition of any item sold pursuant to these rules. The purchaser bidding shall agree to purchase said items, conditions "as is–where is." This waiver includes, but is not limited to a waiver of any purchaser's claim pursuant to Minn. Stat. §§ 336.2-312 through 336.2-315.

B. Transfer requirements and costs. The purchaser shall assume all cost of title transfer and required vehicle registration fees, if any. Items shall not be removed from the premises until the full purchase price and sales tax have been paid, insurance information provided (insurance company and policy number or binder) and the required license plates are attached to the vehicles, where applicable.

§ 1.3303 Auction sales. Pursuant to Minn. Stat. § 16.07, subd. 10, surplus personal property may be sold by auction as follows:

A. Notification of auctions. Persons wishing to be notified of state public auction sales snall contact the State Surplus Property Sales Section, 671 N. Robert, St. Paul, Minnesota 55101, giving their name and complete address. All interested persons shall be placed on an auction mailing list and shall receive bulletins of all public auctions held by the state. State auctions shall also be advertised in news-media at least seven (7) days prior to the sale. News media used may include the Minneapolis and St. Paul papers and/or local papers in the immediate vicinity of the sale.

B. Auction terms and requirements. The full amount of the bid price shall be paid at the time of sale for each item selling for less than $500.00. A minimum of ten percent (10%) of the bid price shall be paid at the time of the sale for each item selling for $500.00 or more. All personal checks shall be accepted for the full amount or the ten percent (10%) down on the day of the sale. A successful bidder shall pay any balance due on the sale, including sales tax, within five (5) days from the date of the sale. Such balance due payments shall be in the form of cash, money order, certified check, or bank draft, made payable to the "Minnesota State Treasurer." Full payment shall be received prior to release of merchandise. Failure on the part of the pur-

chaser to remit the balance due on the amount of the bid within five (5) days shall constitute forfeiture of the amount paid at the time of the sale.

C. Application for auctioneers. All auctioneers interested in providing their services to the state shall submit their name and address to the State Surplus Property Sales Section, 671 N. Robert, St. Paul, Minnesota 55101. Sealed bid invitations for auctioneering services shall be mailed to all interested persons for each scheduled auction. Contracts for auctioneering services shall be awarded to a qualified, licensed auctioneer based on the bid requirements, and the lowest percentage fee of each sale's proceeds. In the event of tied commission fee bids, auctioneer shall be chosen on the basis of a draw or by bid negotiation.

§ 1.3304 Sealed bid sales. Pursuant to Minn. Stat. §§ 16.02, subd. 18; 16.07, subd. 2 and 4; 16.08 and 16.24, surplus personal property may be sold by sealed bid as follows:

A. Notification of sealed bid sales. Persons interested in bidding on the purchase of state surplus personal property shall contact the State Surplus Property Sales Section, 671 N. Robert, St. Paul, Minnesota 55101, giving their name and complete address. All interested persons shall be required to indicate the types of property they desire to purchase and shall then be placed on mailing lists by commodity group(s). Applicants shall be advised by sealed bid invitation of all applicable commodities for sale in their respective commodity groups.

B. Conditions for sealed bid sales. The estimated number or weight of the items listed for sale is for the general guidance of bidders and the state shall assume no responsibility for any variance therefrom. In accordance with the bid requirements, certified checks, cashier's checks, or money orders of successful bidders submitted with the bid, may constitute liquidated damages for failure of bidder to enter into contract. Sealed bid sales shall be awarded to the highest responsible bidder.

C. Removal from mailing lists: Applicants on sealed bid mailing lists who have not bid for the purchase of state surplus property for a period of two or more years may be removed from all applicable mailing lists. Applicants shall be reinstated upon written request.

§ 1.3305 Negotiated sales. Pursuant to Minn. Stat. § 16.07, subd. 4, surplus property sales estimated to be $5,000 or less may be made either upon competitive bids or in the open market.

A. Notification of negotiated sales. Persons wishing to be notified of a proposed negotiated sale of specific state surplus personal property shall contact the State Surplus Property Sales Section, 671 N. Robert, St. Paul, Minnesota 55101.

B. Conditions for negotiated sales. If the state is unable to secure sealed-bids for the sale of property or it is deemed to be in the best interest of the

state, sales may be negotiated with persons who have indicated an interest in the purchase of a specific commodity. So far as practicable, the sales shall be based on at least three competitive bids, shall be permanently recorded and awarded to the highest responsible bidder. The full amount of the purchase price shall be paid at the time of sale. All personal checks shall be accepted for the full amount of sale.

§ 1.3306 Public employee purchase of state surplus property.

A. Pursuant to Minn. Stat. § 15.054, employees of the state and its political subdivisions are permitted to purchase state surplus personal property including one motor vehicle within each 12 month period via public auction or sealed bid process.

B. Public employees directly involved in the sales process shall not be eligible to purchase state surplus personal property for which they have specific disposition responsibility.

Chapter 10 Central Motor Pool

§ 1.3501 Scope and purpose. The purpose of these rules is to define the procedures of the Department of Administration, Central Motor Pool Division, relating to handling insurance claims involving Central Motor Pool vehicles pursuant to Minn. Stat. § 16.75. All references to "Central Motor Pool Division" below mean Central Motor Pool Division, Department of Administration, 610 N. Robert Street, St. Paul, Minnesota 55101.

§ 1.3502 Insurance claim procedures.

A. When a Central Motor Pool vehicle is involved in an accident, the driver of the state vehicle shall complete an accident report on form DPS 32001. This report is to be completed within 3 days of the accident and sent to the Central Motor Pool Division, 610 N. Robert Street, St. Paul, Minnesota 55101. The Central Motor Pool Division shall complete the portion of the form entitled "Insurance."

B. For accidents involving personal injury, death, or total property damage of $300 or more, the Central Motor Pool Division shall forward the accident report to the Department of Public Safety within ten (10) days of the accident, as required by law. A copy of the accident report shall be retained by the Central Motor Pool Division.

C. Notification of the accident, including a copy of the accident report, shall be sent to the state's insurance company by the Central Motor Pool Division. Contact with third parties to discuss settlement for injury or property damage may be initiated by the state's insurer. The Central Motor Pool Division shall direct any persons wishing to file a claim against the state to the proper agency for consideration of such a claim.

D. If it is evident that the other driver was at fault, a claim may be filed with his/her insurance company by the Central Motor Pool Division. A copy of the official repair estimate shall be included. The repair estimate shall be supplied by the body repair shop having the contract for repair of state vehicles or by other responsible body repair shops as approved by the Director of the Central Motor Pool Division.

E. When a check is received covering the damage done to the Central Motor Pool vehicle, a release shall be signed, and the check deposited in the Central Motor Pool revolving fund.

Chapter 11 Plant Management

§ 1.4001 Parking. Pursuant to Minn. Stat. § 16.72, subd. 2, this rule governs the parking of motor vehicles in parking facilities owned or operated by the State of Minnesota and under the control of the Commissioner of Administration.

A. Lots and facilities. Parking lots or facilities governed by these rules are located within the Capital Complex, the City of St. Paul, and the City of Minneapolis, and include the following:

1. outdoor lots within the Capitol Complex; at the Economic Security Building, 309 - 2nd Avenue South, Minneapolis; 1246 University Avenue, St. Paul; and at the State Department of Health Building, 717 Delaware Avenue Southeast, Minneapolis;

2. indoor parking facilities located in the Department of Transportation Building in the Capitol Complex; the Economic Security Building, 390 North Robert Street; 1246 University Avenue, St. Paul; and the State Department of Health Building, 717 Delaware Avenue Southeast, Minneapolis;

3. ramp parking facilities located in the State Administration Building and adjacent to the Centennial Building, both in the Capitol Complex;

4. street parking facilities located on Aurora Street between Cedar Avenue and Park Avenue.

B. Prohibited parking. All parking of motor vehicles is prohibited across driveway entrances; upon sidewalks; along yellow painted curbing; within 15 feet of fire hydrants; within 20 feet of crosswalks or intersections; in stalls assigned to other persons unless permission is granted by such persons; in driveways; and in restricted zones of lots, ramps, or other posted areas.

C. Application for parking. Applications for contract parking shall be made in writing to the Director of the Plant Management Division located at Room G-9, State Administration Building, St. Paul, Minnesota 55155. The application shall bear the written signature of the person applying and contain the following information: employing agency, telephone number at place of work, type of vehicle (compact or regular), motor vehicle license number, and all other relevant information requested by the Director. Additional information may be required, including the name of each passenger, if carpooling, the employing agency of each passenger, and location if other than in the Capitol Complex. If a desired facility is requested, the facility shall be identified. The applicant shall not submit payment with the application.

D. Permits shall be granted to applicants in the following priority order:

1. applicants qualifying for a handicapped parking permit per 2 MCAR § 1.4001 H. or demonstrating special needs or circumstances arising from position, nature of work, and/or travel requirements;

2. applicants with riders with the applicant with the highest number of riders first, the applicant with the second highest number of riders second, etc.;

3. all other applicants on a first come-first served basis.

E. Stickers. All authorized parking contract recipients shall be issued a sticker of proper identifying color. Stickers shall be displayed on the reverse side of the rearview mirror.

F. Fees for parking shall be set by the Commissioner of Administration with the approval of the Commissioner of Finance and shall be based on consideration of, but not limited to, the following factors:

1. administrative overhead and operating cost;

2. surcharge required pursuant to Minn. Stat. § 16.72, subd. 7; and

3. number of car pool passengers, if any.

G. Exemptions from parking surcharge.

1. Pursuant to Minn. Stat. § 16.72, subd. 7, the following are exempt from surcharge:

a. parking contract holders whose work shift is other than the customary daytime work hours, including those individuals employed on rotating shifts;

b. parking contract holders whose work activity does not conform to the customary hours or patterns of work so as to preclude the opportunity to participate in a car pool.

2. Application. Any person wishing to apply for exemption from the surcharge shall apply in writing on the forms provided to the Division of Plant Management, Department of Administration.

3. Notice of approval or denial for the exemption of the surcharge shall be sent in writing to the applicant.

H. Handicapped. To receive a handicapped parking permit, a written application shall be submitted to the Director of the Plant Management Division at the above-noted address stating the circumstances and extent of the handicap. Certification of handicapped eligibility pursuant to Minn. Stat. § 169.345 shall be deemed sufficient showing to authorize vehicles bearing proper identification of such certification to use handicapped designated parking facilities in the Capitol Complex and other facilities. Upon receipt of an application from a noncertified person, the Director shall instruct the applicant to contact the nurse in the Transportation or Centennial Building for verification of the disability. A written recommendation from the nurse is

required stating the estimated length of time required to accommodate the disability. Handicapped parking shall be available on a first come-first served basis. Regular parking rates shall apply.

I. Special temporary permits. For departments or agencies having individuals or groups visiting the Capitol Complex for meetings or hearings, temporary reserved hooded meter parking may, if available, be obtained upon request to the Director of the Plant Management Division, for which a per day per unit fee shall be paid by the requesting organization. The amount of the fee shall be set by the Commissioner of Administration and approved by the Commissioner of Finance.

J. Violations. Pursuant to Minn. Stat. § 16.72, subds. 3 and 4, when any motor vehicle is parked in violation of these rules a traffic warning or summons ticket shall be issued to the vehicle or person(s) deemed as the violator(s).

K. Removal and impounding. Any vehicle parked upon any parking lot or facility owned or operated by the State, not in conformity with the aforementioned rules, state law, or local ordinances, may be declared a public nuisance and removed or impounded as set forth in Minn. Stat. § 16.72, subd. 3. The cost of such removal or impounding shall be a lien against the motor vehicle until paid.

L. Legislative parking resolutions. Pursuant to Minn. Stat. § 16.72, subd. 6, these rules shall not affect regulation of parking of certain vehicles as provided by resolution of the legislative bodies during legislative sessions.

§ 1.4101 Personal property lost on state property.

A. Pursuant to Minn. Stat. § 16.022, personal property found in the Capitol Complex or other buildings under the custodial control of the Commissioner of Administration shall be sent to the Plant Management Division, Department of Administration, Room G-9, State Administration Building, 50 Sherburne Avenue, St. Paul, Minnesota 55155. Each article shall be labeled indicating the date, the place where the article was found, and the name and telephone number of the finder.

B. Any person wishing to recover any personal property which may have been lost in the Capitol Complex or other buildings under the custodial control of the Commissioner of Administration shall contact the Plant Management Division at the above-noted address, giving a description of the lost property, the approximate time, and the location where it may have been lost.

C. Articles sent to the Plant Management Division shall be disposed of in accordance with Minn. Stat. § 16.0231.

§ 1.4201 Permits for public rallies in the Capitol Complex. Pursuant to Minn. Stat. § 16.02, subd. 6 and 6a, the following rule governs the issuance of per-

mits for public rallies in or on the Capitol Complex buildings and grounds. "Public rallies" for the purpose of this rule mean parades, gatherings, solicitations, concerts, speeches or rotunda ceremonies, and other such related uses of the buildings, grounds, and state-owned streets in the Capitol Complex.

A. This rule defines the permissible time, place, duration, and manner of the use of the Capitol Complex grounds, including the rotunda, sidewalks, Capitol Building steps and state-owned streets for public rallies, so as not to unreasonably interfere with the rights of others to the use of such public areas, to assure access to driveways and building entrances, to assure traffic movement in such a manner so as to not deprive the public and state employees of police and fire protection, and to assure the public of safe use and enjoyment of such public places.

1. Any person, firm, partnership, association, corporation, company, or organization shall secure a permit from the Director of Plant Management Division, Department of Administration, Room G-9, State Administration Building, 50 Sherburne Avenue, St. Paul, Minnesota 55155, to conduct a rally on the Capitol Complex grounds prior to announcing or conducting such public rally.

2. Any such person seeking a permit for a public rally shall submit, not less than seven (7) working days prior to the proposed date of the event, a written application identifying the person, firm, partnership, association, corporation, company or organization; mailing address and telephone number; date; time; and name, address, and the telephone number of the contact person who shall be responsible for the public rally; and all other relevant information requested by the Director of the Plant Management Division. The Director, where compelling reasons are shown therefore, and if staff and time are available to make arrangements necessary to protect the public interest, shall have the authority to consider any application hereunder which is filed less than seven (7) working days before the date such rally is proposed to be conducted.

3. Proof of Workers Compensation and public liability insurance shall be submitted when required by Director.

4. Upon consideration of the request for the permit, and after written agreement is reached between the parties involved regarding security, police protection, liability for damages, and cleanup of the areas, the Director of Plant Management shall approve the permit application unless any of the following is found to exist:

a. The conduct of the rally will substantially interrupt the safe and orderly movement of other traffic contiguous to its route or location.

b. The conduct of the rally would require the diversion of so great a number of the security force of the Capitol to properly police the line of movement and the areas contiguous thereto as to prevent normal security.

c. The concentration of persons, animals, and vehicles at assembly areas of the rally will unduly interfere with proper fire and police protection of, or ambulance service to, areas contiguous to such assembly areas.

d. The conduct of such rally will interfere with the movement of fire-fighting equipment enroute to a fire.

e. The rally is not scheduled to move from its point of origin and to its point of termination expeditiously and without unreasonable delays enroute.

f. The rally is to be held for the sole purpose of advertising any product or goods or is designed to be held all or in part for private profit.

g. The rally will unreasonably disrupt the normal operations of state government and the public right of safe use or reasonable enjoyment of public spaces.

B. A permittee hereunder shall comply with all permit directions and conditions and with all applicable laws and ordinances. The rally chairperson or other person heading or leading such activity shall be in possession of the permit during the conduct of the rally.

C. Whenever any rally is conducted in a manner substantially different from that indicated in the permit application and rules therefore, the permit shall be deemed to be automatically revoked and shall be forfeited.

D. No public rally in the Capitol Complex shall be undertaken unless a permit has been obtained as required above. Any person violating this rule, or applicable state or local law, may be subject to prosecution under applicable law.

Chapter 12 Publications and General Services Division

§ 1.4501 Purpose and scope. The procedures herein relate to the Commissioner of Administration's authority pursuant to Minn. Stat. §§ 16.61, 331.07, 331.08, and 331.09, providing in part for the certification of and computation of standard and adjusted line rates.

§ 1.4502 Definition of a "standard line" for legal notices. The "standard line" shall be 6-point Times Roman with a lower case alphabet of 90 points set on a 6-point slug without spacing between the lines, and 11 picas in length, as required by Minn. Stat. § 331.07.

§ 1.4503 Evaluation and certification of line rates for legal notices.

A. Request for evaluation and certification. The following procedures shall be followed to request (1) an adjustment evaluation from the standard line and (2) certification of standard or adjusted line rates to any Minnesota newspaper, public official, or interested party requesting same.

1. The functions of computing adjustment evaluations and issuing certifications of standards of adjusted line rates are performed only upon written request.

2. Requests shall be completed as follows:

a. All requests shall be filed with the Commissioner of Administration, c/o State Printer, 506 Rice Street, St. Paul, Minnesota 55103.

b. The request shall contain the following:

(1) statement by publisher:

(a) name of newspaper;

(b) street address, zip code, city and county;

(c) publisher's name;

(2) method of production:

(a) letterpress, matted & plated, or print from type;

(b) offset, hot type, cold type, or hot and cold type;

(3) type used in printing legal ads:

(a) type size and name of type;

(b) pica width of single and double column;

(c) hot or cold type;

(d) justified or not justified (if not justified, minimum sample of five (f) inches of type set in column width of the type used must be provided with request);

(e) three (3) lower case alphabets in compact form for each column width and style of type which requires certification;

(f) if the page forms are reduced in the camera or are matted, the lower case alphabet supplied must be reduced at the same percentage;

(g) other relevant information requested by the Commissioner or his agent.

c. Publishers who change type faces or who make format changes that affect column widths may apply for new certified rates, including in the request a minimum of three (3) lower case alphabets in compact form (no letter spacing) for the type style to be used and for each of the column widths requiring new line rates.

B. Formula for evaluation.

1. To calculate line rates for non-standard type faces and non-standard line lengths, the formula to be used is based on the proportion of the alphabet length of the "standard" type face to the alphabet length of the non-standard type face, in relation to the proportion of the length of the non-standard line to the length of the "standard" line, in relation to the line charge for the "standard" line.

Formula for above is as follows:

$$\frac{\text{L.C. Alphabet (in points) of 6-point Times Roman}}{\text{L.C. Alphabet (in points) of type you use}} \times \frac{\text{Your column width (in picas)}}{\text{Standard Times Roman 11 pica line length}} \times \text{Standard Line Rate} = \text{Adjusted Line Rate}$$

2. A separate line rate certification is required (1) for each type face used in setting for legal notices, and (2) for each line length used in setting type for legal notices. Each line rate certification applies to only one type face and one column width (measuring from direct left to direct right of line length). It may not be used for any other billing. Line rate certification procedures apply to cold type composition as well as hot metal typesetting.

§ 1.4504 Fees for publication of legal notices. Fees for publications are established by Minn. Stat. § 331.08 for a standard line for first insertion and subsequent insertions and for what is termed "price and one-half" or "double price" composition. The definition of "price and one-half" or "double price"

composition is established by the State Printer and published in the pamphlet "Publication of Legal Advertising in Newspapers," including approved forms and computation samples, as required by Minn. Stat. § 16.61.

§ 1.4505 Controversy between publisher and public official.

A. In case of controversy or disagreement between a publisher of a newspaper and a public official of this state as to the measurement of any legal notice published or required by law to be published in newspapers, such public official shall submit a copy of the printed notice to the Commissioner of Administration in accordance with the procedure described herein. The Commissioner shall measure such notice and forward a certificate signed by him giving the number of lines and the amount of the fees allowed for the publication of such notice.

1. The following procedure is required:

a. The public official shall send one complete copy of the legal publication to be measured to the Commissioner of Administration, c/o State Printer, 506 Rice Street, St. Paul, Minnesota 55103. Said copy of publication will not be returned.

b. The public official shall also send an affidavit of publication with indication of lower case alphabet and the number of insertions used in said publication.

c. When disputed legal notices have been set by a third party, the public official shall state who set the legal notice and furnish three (3) copies of lower case alphabet in compact form of type used.

d. If copy for legal notices is furnished in camera ready form for use in the newspaper, the public official shall so state. (Camera ready copy is measured in the same manner as a ballot.)

e. If legal notice was reduced by camera or matted at time of publication, the public official shall require the newspaper to submit a lower case alphabet reduced by the same percentage as the notice which was published.

f. A stamped, return addressed number ten (10) envelope shall accompany each measurement requested.

2. A complete copy of legal publication along with the computation sheet and a copy of certificate of measurement will be kept on file for at least one (1) year.

Chapter 13 Real Estate Management

§ 1.5001 Property acquisition. Pursuant to Minn. Stat. Ch. 16 and specific legislative enactments, this rule shall govern the state's acquisition of real property for the operation of state government.

A. Unless otherwise provided by law or by reorganization order issued pursuant to Minn. Stat. §§ 16.125 and 16.135, a state department or agency needing real property shall make a request in writing to the Department of Administration to acquire property, specify the property to be acquired, and indicate the source and sufficiency of funds needed for the acquisition.

B. Real Estate Management Division shall proceed with acquisition as follows:

1. The title to the property shall be examined by an attorney for the Division, whereupon a field title report shall be prepared by the Division. The field title report shall be based on information from the owner or a representative of the owner. The purpose and nature of the acquisition shall be explained to the owner at the time of the field title interview. Where there are occupied buildings involved, a relocation study shall be made to insure that displacees can be relocated without undue hardship.

2. A legal description of the property to be acquired shall be written. Where necessary, a written engineering assessment shall be obtained from the State Architect's Office.

3. The property to be acquired shall be appraised. Appraiser(s) shall be selected by the Director or the Assistant Director, and may be state employees or fee appraisers. Where fee appraisers are used, they shall be selected from a list of qualified fee appraisers, which list shall be maintained by the Division. The fee to be paid to the appraiser shall be as agreed upon between the appraiser and the Director or the Assistant Director.

4. The appraisal(s) shall be reviewed by members of the Division staff. Where the appraisal(s) are deemed satisfactory, the appraisal amount which is deemed to represent value (and damages, where applicable) shall be certified by the Director of the Assistant Director.

5. Instruments appropriate for the acquisition shall be requested from the Attorney General's Office.

6. A direct purchase offer shall be submitted to the property owner. Where possible and practical, the offer shall be submitted in person. A detailed explanation of the state's acquisition policies and of the owner's options shall be made to the owner, especially including, where applicable, a full explanation of relocation benefits available to the owner.

7. If the owner accepts the offer, the property shall be purchased. The Division shall be responsible for proper execution of instruments, closing of

transaction, recording of instruments, payment to owner, relocation assistance to the owner, and removal of buildings, where applicable.

8. If the owner rejects the offer, and the legislature has directed by law that acquisition by eminent domain proceedings shall or may be pursued, the Division shall institute necessary proceedings to so acquire.

§ 1.5101 Issuance of permits or easements across state lands. Pursuant to Minn. Stat. § 16.88, this rule shall govern the availability to the public of permits or easements to cross state-owned land other than state-owned land expressly exempted.

A. An application for a permit or an easement to cross state-owned land shall be made in compliance with Minn. Stat. § 16.88, Subd. 3, to the Director, Real Estate Management Division, Department of Administration, Room G-22 Administration Building, 50 Sherburne Avenue, St. Paul, Minnesota 55155.

B. The Real Estate Management Division shall grant or deny the application in accordance with the provisions of Minn. Stat. § 16.88. The applicant shall be informed in writing of granting or denial of the permit or easement. Where the application for permit or easement is denied, the applicant shall be informed of the reasons for such denial.

C. Pursuant to paragraph B. above, where the application for permit or easement is granted, the permit or easement shall be granted only after agreement by the applicant to pay to the state an amount to be determined on the basis of an appraisal by the Real Estate Management Division, and to comply with all terms and conditions of the permit or easement.

D. Except where the permit or easement is clearly a benefit to the state, no permit or easement shall be granted for less than the amount of $100.00.

§ 1.5201 Permits to search for lost property. Scope and purpose. Pursuant to Minn. Stat. §§ 16.021, 16.022, and 16.023, 2 MCAR §§ 1.5201-1.5205 govern the granting of permits to search upon lands owned by the state for abandoned or lost property and disposition of abandoned or lost property found thereunder.

§ 1.5202 Terms and conditions. Permits shall be granted upon permittee's agreement to and performance of the following terms and conditions:

A. Permittee shall indemnify and hold the State of Minnesota harmless for any claim, meritorious or otherwise, and for any clauses of action regardless of their nature arising directly or indirectly out of any permittee's activities. The state shall not be liable for any damage to property of permittee or injury to permittee or invitees.

B. If in the opinion of the Director or the Assistant Director the activity to be conducted may endanger life or property, permittee shall purchase lia-

bility insurance which protects all persons and their property from injury or damage. The amount of such liability insurance shall be no less than:

Minimum coverage per person per occurrence	$100,000
Minimum coverage per occurrence	$500,000

The State of Minnesota shall be designated as sole payee in the event of loss.

C. Permittee shall obey and conform to all federal, state, and local laws, rules and ordinances.

D. Permittee shall cause no damage to any property by virtue of its activities. In the event of any damage to any state property, permittee shall immediately repair same. Failure to immediately make such repairs when advised to do so in writing by the Director or Assistant Director shall result in cancellation of permit.

E. Permittee shall conduct its activities in a manner so as not to adversely affect the environment and shall restore areas of activity to original conditions. Permittee shall remove all equipment relating to and debris resulting from permittee's activities from state land by the termination date of the permit.

F. Permittee shall limit its activities on state land to areas specified by the permit.

G. Unless otherwise specified, permits shall remain in effect for one year from effective date so long as conditions prescribed hereby and in the permit are met.

H. Permittee shall neither assign nor transfer any rights or obligations under the permit without the prior written consent of the Commissioner or his authorized designee.

I. Permittee shall not vary the permit without the prior written consent of the Commissioner or designee.

J. Receipt of permit shall not constitute an exclusive grant, and the state may issue similar or identical permits for the same or overlapping areas of land.

K. The permit may be cancelled by either party at any time, with or without cause, upon thirty (30) days' written notice to the other party.

L. Unless specifically excepted for cause in the permit, all permits shall be granted with the understanding that the lost or abandoned property which is recovered from state lands shall be turned over to the Department of Administration for disposition as provided by statute. The permittee's share of the proceeds shall be agreed upon between the permittee and the state prior to issuance of the permit. The state's share shall be deposited in the general revenue fund.

§ 1.5203 Application for permit. Applications for permits shall be made in writing to the Division to the following address:

Director
Real Estate Management Division
Department of Administration
G-22 State Administration Building
St. Paul, Minnesota 55155

Application shall include the following items:

A. applicant name, mailing address, and phone number;

B. description of proposed search;

C. written acceptance of the specified terms and conditions;

D. specification of area within which activity will take place.

§ 1.5204 Granting of permits. Upon receipt of application, the Commissioner or designee shall undertake the following action:

A. determination as to department jurisdiction over the lands concerned in the application;

B. determination as to the necessity for liability insurance as specified in 2 MCAR § 1.5202 A. and B.;

C. preparation of a written agreement between the state and the applicant;

D. submission of permit (written agreement) for review and signature by Department of Finance and Attorney General.

Upon execution of the written agreement, the permit shall be in effect under the terms and conditions thereof.

§ 1.5205 Disposition of found property. Upon discovery of lost or abandoned property, permittee shall, within thirty (30) days of discovery, place such property at the disposal of the Commissioner. The Commissioner or designee shall determine the method and location of maintenance and storage of property. Property will be disposed of under the procedure specified by Minn. Stat. § 16.022. Upon disposition, the Commissioner or designee shall, in a timely manner, authorize payment to the finder the share due him under the terms and conditions of the permit.

§ 1.5301 Property leasing (where state is lessor). Pursuant to Minn. Stat. § 16.02, subd. 14, this rule governs the leasing out of state-owned real property which is temporarily not needed by the state.

A. All persons wishing to be notified of the availability for leasing of state-

owned property shall request in writing such notification. Requests shall be sent to:

Director
Real Estate Management Division
Department of Administration
G-22 Administration Building
50 Sherburne Avenue
St. Paul, Minnesota 55155

A list of persons having requested such notification shall be maintained by the Real Estate Management Division. The list shall indicate the particular area in the state and the type of property (i.e., farm, office, etc.) the interested party has expressed an interest in. Notice shall be sent to all appropriate parties on the list when state-owned property is leased out.

B. At least fifteen (15) calendar days prior to the bid return deadline, bid solicitations shall be mailed to appropriate parties who have requested notification of the availability of property for leasing. In addition to mailing of bid solicitation to all parties known to have an interest in leasing the property, the Department of Administration may, where circumstances merit, advertise the property for lease in a newspaper having general circulation in the area in which the property to be leased is located. The property shall be leased to the highest responsible bidder, consistent with the State's intended use and management of the property. The Department expressly reserves the right to reject any or all bids or to waive informalities therein.

C. Competitive bidding shall not be used when the Commissioner or designee determines that one or more of the following circumstances exist.

1. There is only one interested party that can feasibly use the property.

2. Factors other than bid price, such as maintenance of the property, are paramount.

3. The contemplated rental term is of short duration.

4. Other governmental entities have expressed the desire to lease the property.

5. Factors exist which make the taking of competitive bids impractical or not in the best interest of the State of Minnesota.

Chapter 15 Telecommunications

§ 1.6001 Scope and purpose. Pursuant to Minn. Stat. § 16.02, subd. 2. a., these rules govern the procedures relating to the application by governmental bodies for sublease of TELPAK services from the Telecommunications Division, Department of Administration, G-4 Administration Building, 50 Sherburne Avenue, St. Paul, Minnesota 55155.

§ 1.6002 Definitions.

A. For the purposes of 2 MCAR §§ 1.6001-1.6005, the terms defined herein shall have the meanings given them, unless clearly indicated otherwise by the context.

1. "TELPAK" means intercity private telephone circuit groups leased by the Telecommunications Division of the Department of Administration from any source including a common carrier, specialized common carrier, or the federal government.

2. "Governmental Body" means any unit, agency, or political subdivision of state or local government.

§ 1.6003 Application for sublease.

A. Any governmental body may apply for subleasing TELPAK in accordance with applicable tariffs. Applications shall be made in writing to:

Telecommunications Division
Department of Administration
G-4 State Administration Building
50 Sherburne Avenue
St. Paul, Minnesota 55155

B. The application shall include the following:

1. name and address of governmental body applying for use of TELPAK service;

2. name, address, and telephone number of applicant's representative who will administer the lease;

3. name and address for billing of charges;

4. termination points and intended use of TELPAK circuits requested.

§ 1.6004 Application approval.

A. Applications shall be approved or rejected based on the availability of unused circuits and projections of state needs. No obligation exists on the part of the state to sublease any requested TELPAK.

B. All applicants shall be notified within a reasonable time in writing of the disposition of their application.

§ 1.6005 Fees and conditions.

A. Fees shall be established with the approval of the Commissioner of Finance and shall be based on TELPAK cost to the Telecommunications Division and administrative overhead costs. Fees shall be changed as the above-noted cost factors change.

B. The following general terms shall apply to all leased TELPAK.

1. The Telecommunications Division or the user may terminate the sublease on thirty (30) day written notice to the other party.

2. The Telecommunications Division assumes no liability for any service interruptions or other damage suffered by lessee as a result of TELPAK use.

RULES GOVERNING MINIMUM STANDARDS AND ADMINISTRATION OF MINNESOTA 911 EMERGENCY TELEPHONE SERVICE (MINN. STAT. §§ 403.01-403.12)

2 MCAR § 1.6101 Purpose of rules. It is the purpose of these rules to give effect to Minn. Stat. § 403.01 et seq. which requires each county within the Twin Cities Metropolitan Area to establish a 911 emergency telephone system on or before December 15, 1982, and each remaining county within the state to establish a 911 system on or before December 15, 1986.

2 MCAR § 1.6102 Definitions. For the purpose of these rules, the terms defined in this section shall have the meanings given them.

A. "Automatic Number Identification (ANI)" means the process of electronically identifying and displaying on a special viewing screen the telephone number of the calling party's telephone to a 911 answering person as the call is being answered.

B. "Dedicated 911 trunk" means a telephone circuit which is used exclusively for the purpose of transmitting 911 calls.

C. "Busy Hour" means a one hour period during a 24 hour day where the number of 911 calls to the Public Safety Answering Point is usually a maximum. Similarly, "Busy Month" means the busiest month during a 12 month period.

D. "Public Agency" means any unit of local government or special purpose district located in whole or part within this state which provides or has authority to provide fire fighting, police, ambulance, medical or other emergency services.

E. "PSAP" or "Public Safety Answering Point" means a communications facility operated on a 24-hour basis which first receives 911 calls from persons in a 911 service area and which may, as appropriate, directly dispatch public safety services or extend, transfer, or relay 911 calls to appropriate public safety agencies.

F. "PSAP Manager" means the person having day-to-day responsibility for the operation of the public safety answering point.

G. "Selective Routing" means a process through which a 911 call is routed by means of a special telephone trunking and electronic equipment configuration to a predesignated public safety answering point.

H. "Telephone Exchange Area" means a specific geographic area designated by the Department of Public Service which is served by one or more central offices.

I. "Telephone Exchange Area Central Office" or simply "Central Office" means the site of the telephone switching equipment and the switching equipment itself for a specific telephone exchange area.

2 MCAR § 1.6103 Establishment of County 911 Planning Committee.

A. Each County Board of Commissioners in the State of Minnesota shall establish a committee to develop 911 emergency telephone service plans for the county. The committee so established shall be known as the "County 911 Planning Committee". Members on this committee shall not be considered public officers or employees by virtue of their membership on the committee.

B. The County 911 Planning Committee shall include representation by emergency service providers and shall be responsible for developing the 911 telephone system plan as required by these rules.

2 MCAR § 1.6104 Submission of tentative plans. Each county shall submit a tentative 911 emergency telephone service plan to the Department of Administration and the Department of Public Service before December 15, 1978, and shall include the following information:

A. The mailing address of the county, the names of the members of the County 911 Planning Committee, the date the plan is submitted to the Department of Administration, the date 911 telephone service is proposed to be implemented and the signature of the person authorized to submit the county 911 plan.

B. A map showing the boundaries of telephone exchanges included in the proposed system area, telephone central office locations, and the proposed PSAP location(s).

C. A list of all participating agencies whose services will be available by dialing 911.

D. A list of proposed system hardware, trunking and features showing respective installation, and recurring costs. Budgetary estimates as provided by the serving telephone companies are acceptable.

2 MCAR § 1.6105 Submission of final plans. Each county shall submit a final plan to the Department of Administration and the Department of Public Service before December 15, 1979, and shall include the following information:

A. The mailing address of the county, the names of the members of the County 911 Planning Committee, the date the plan is submitted to the Department of Administration, the scheduled implementation date of 911 telephone service, and the signature of the person authorized to submit the county 911 plan.

B. A map of the county which shows the telephone exchange boundaries, and the PSAP location(s), and any other pertinent jurisdictional boundaries.

C. The name and mailing address of the agency operating each PSAP and the name and telephone number of the PSAP manager.

D. A description of the procedures and agreements for responding to 911 calls which are routed to a PSAP other than the one which serves the area from which the call originates.

E. A description of the 911 system routing and switching configuration with pertinent technical equipment specifications.

F. A description of the trunk routing, a description of the central office equipment to be used, and the trunk mileage computations if the proposed 911 system included selective routing.

G. An itemized list of estimated recurring and installation costs for all proposed telephone equipment and service. These estimates shall be provided by the telephone companies at no charge and shall be signed by an authorized telephone company employee.

H. A certification from the county board that the plan meets the requirements of those public service agencies whose services will be available by dialing 911.

I. A list of all participating agencies whose services will be available by dialing 911 with the following information for each listed agency:

1. agency name;

2. agency mailing address;

3. name and telephone number of the agency head;

4. a brief description of the services to be provided;

5. a description of current and proposed dispatching procedures.

J. A description of the secondary means of providing service in the event of the failure of either or both of the following:

1. All or a portion of the 911 emergency telephone system.

2. Failure of PSAP primary electrical power.

2 MCAR § 1.6106 Certificate of plan approval.

A. Following review and comment on the plan, the Department of Administration shall base acceptance of the final plan upon compliance with no provisions contained in these rules. The Department shall notify in writing the designated county official of the acceptance of the plan and shall include an itemization of those costs which will be eligible for payment by the state. This approval shall be in the form of a "Certificate of 911 Plan Approval".

B. If a final plan is disapproved, the Department of Administration shall issue a "Notice of Rejection" to the designated county official within six months from the date of submission, which notice shall set forth the reasons for disapproval.

2 MCAR § 1.6107 Resubmission of plans. If a final plan is disapproved by the Department of Administration, a revised plan shall be resubmitted by the designated official within 90 days of the notice of rejection. The state shall review the revised plan and issue its approval or disapproval on the same basis as its consideration of the initial plan within 30 days following receipt of the revised plan.

2 MCAR § 1.6108 Design standards.

A. The 911 system shall be designed and operated to maintain a grade of service such that no more than one call out of 100 incoming calls will receive a busy signal on the first dialing attempt during the busy hour of an average week during the busy month.

B. Where such services are available within a 911 service area, the 911 system shall include the following:

1. Police services. This term includes police, sheriff's departments and state patrol.

2. Fire fighting services.

3. Emergency medical services. This term includes ambulance service and first aid or other immediate response service provided directly to the caller.

C. Other public safety and civil defense services may be included in the 911 system at the discretion of the public agency operating the PSAP.

D. PSAP answering equipment shall permit answering personnel to place the 911 call on hold.

E. Each PSAP and each participating agency shall have at least one published telephone number to call for non-emergency services. One number may be shared by two or more participating agencies provided there is a cooperative agreement for call answering responsibility.

F. Remote automatic alarm systems and other related devices shall not be installed in such a manner that an automatic alarm signal is connected to the 911 trunks.

2 MCAR § 1.6109 Operational requirements.

A. 911 shall be the number published in the telephone directory to call in order to receive emergency assistance within the area served by each 911 system.

B. The PSAP manager shall monitor the 911 system grade of service so that the requirements as set forth in this section are met, and shall initiate modification of the system consistent with the provisions set forth in 2 MCAR § 1.6113 of these rules if they are not met. Telephone companies providing 911 telephone service shall measure and prepare a report regarding the 911 grade of service at the request of the PSAP manager. For operational purposes, the Department of Administration shall assume an average call duration time of 70 seconds per 911 call.

If the measurement provided by the telephone company as set forth above indicates that the required level of service is not being met, the following steps shall be taken:

1. The serving telephone company shall prepare plans, specifications and cost estimates to raise the level of service to the required level, and such information shall be provided to the PSAP manager.

2. The Department of Administration and the Department of Public Service shall be notified as provided in 2 MCAR § 1.6113 of these rules. If a modification to the system contract is necessary, the provisions in 2 MCAR § 1.6112 of these rules shall be satisfied.

C. Any public safety agency with jurisdiction shall be notified immediately of any emergency within its jurisdiction.

D. Each PSAP shall provide continuous service to all callers within its service area 24 hours each day, seven days a week.

E. Any calls entering the 911 system not requiring the dispatching of a public safety service unit shall be referred to an administrative number.

F. The PSAP manager may maintain a telephone number other than 911 as a backup number to call should the 911 system fail. If such backup service is provided, the designated number shall be published in the telephone directory as the alternate number to call to receive emergency assistance only when the 911 call cannot be completed.

G. The PSAP manager shall develop and maintain a system for recording 911 calls received by the PSAP. The records shall be retained for a period of at least 31 days from the date of the call and shall include the following information:

1. Date and time the call was received.

2. Nature of the problem.

3. Action taken by the dispatcher.

A magnetic tape recording will satisfy this requirement.

H. The PSAP manager and/or other designee of the county board shall prepare and implement a program of public information regarding 911 service prior to system implementation.

I. All tone signals provided to the 911 calling party shall be identical to tones received when making a regular call.

J. The PSAP shall be notified in advance by an authorized telephone company representative of any routine maintenance work to be performed which may affect the 911 system reliability or capacity. Any such work shall be performed during PSAP off-peak hours.

K. All telephone companies providing 911 service shall submit separate itemized bills to the Department of Administration and the local unit of government operating each PSAP, as specified in the contract for 911 service.

L. The Department of Administration shall pay only those recurring charges incurred by a PSAP which has been issued a certificate of plan approval which represent the actual service provided by the telephone company to achieve the level of service as specified in 2 MCAR S 1.6108 A. of these rules. If a county selects a higher level of 911 telephone service, the costs of this added service shall be billed directly to the PSAP.

2 MCAR § 1.6110 Variance from design standards.

A. All requests for a variance shall be submitted to the Department of Administration and the Department of Public Service in written form and shall contain the following information:

1. A description of the variance which is requested.

2. A specific reference to the section of the standard which is applicable.

3. A narrative explanation of the reason the variance is requested.

4. A resolution or copy of minutes of the County Board which authorizes the application for a variance.

5. The signature of the person authorized by the county to make application for the variance.

B. A clear showing of either of the following shall serve as just cause for the granting of a variance:

1. The equipment of the serving telephone utility(ies) is of such design or state of repair that it is not possible or practical to design a 911 telephone

system that conforms with established design standards. Application for variance based upon the above shall include a written statement from an officer of the serving utility(ies) setting forth the reasons the design standards cannot be met by the company.

2. The costs to local government of implementing a 911 telephone system in conformance with these standards would require a tax levy which would exceed the statutory local levy limit.

C. Upon receipt of a request for a variance, the Department of Administration and, as appropriate, the Department of Public Service, shall evaluate the request and schedule an administrative review within 30 days of the date of receipt of the request for a variance.

D. The administrative review shall be informal and the petitioner may present materials, documents, and testimony in support of its request. The Department of Administration shall determine if the request meets the criteria established for granting a variance, and issue its decision within 30 days of the date of review.

E. If the finding of the Department of Administration is that the request meets established criteria, a variance shall be granted and a Notice of Variance shall be issued.

F. If the finding of the Department of Administration is that the request for variance does not meet established criteria, no variance shall be granted and written notice shall be issued setting forth the reasons for denial.

2 MCAR § 1.6111 Waivers from the requirements of Minn. Stat. §§ 403.01-403.08.

A. A waiver from the requirements of Minn. Stat. §§ 403.01-403.08, may be requested by a county, if federal or state financial assistance is not available to pay necessary costs as specified in 2 MCAR §§ 1.6114-1.6115 of these rules and Minn. Stat. § 403.08.

B. All requests for a waiver shall be submitted to the Department of Administration in written form and shall contain the following information:

1. A narrative explanation with cost figures of the reason the waiver is requested.

2. A resolution or copy of minutes of the County Board which authorizes the application for waiver.

C. The waiver, if granted, shall be conditioned on the continued non-availability of state and/or federal assistance. Once a waiver has been granted, the county shall file an annual statement with the Department of Administration certifying the continued non-availability of federal and/or state assistance. When assistance becomes available, the waiver shall extinguish and the

county shall submit, within 6 months, a new implementation schedule, and if necessary, a revised final plan, to the Department of Administration.

2 MCAR § 1.6112 System contracts.

A. When ordering a 911 system or modifying an existing system, each county, together with the Department of Administration and the local government units operating the public safety answering points shall contract with the appropriate public utilities providing telephone service for implementation of the certified 911 system plan.

B. The contract to implement a 911 system shall include an itemized list showing installation and recurring costs for all system features and hardware.

C. Counties with 911 systems designed, contracted for or implemented before December 15, 1978, shall submit one copy of the 911 contract(s) to the Department of Administration and to the Department of Public Service.

2 MCAR § 1.6113 Modification to plan.

A. The PSAP manager through the local unit of government responsible for the operation of the PSAP, shall notify the Department of Administration 30 days in advance of any proposed modification to the 911 system which would modify the plan as certified consistent with the provisions of 2 MCAR § 1.6105.

B. Within 30 days of receipt of such proposed modification, the Department of Administration shall review it for consistency with the requirements of funding eligibility set forth in 2 MCAR §§ 1.6114-1.6115, and issue its approval or disapproval. If the modifications are disapproved, such proposed changes shall be ineligible for funding assistance.

2 MCAR § 1.6114 Funding eligibility/payment of recurring costs.

A. Recurring costs of providing minimum 911 telephone service shall be paid by the state, as described herein, consistent with available funding, provided an approved final plan is on file with the Department of Administration and a Certificate of Plan Approval has been issued.

B. The following recurring costs shall be paid by the state:

1. The recurring costs associated with trunks and dial access trunk equipment necessary to provide the minimum grade of service as defined in 2 MCAR § 1.6108 A. Additionally, in those exchange areas where the minimum grade of service can be achieved with only one trunk due to extremely low population density, a second trunk is eligible if call-extending features are provided by the PSAP and 600 or more main stations are located in the exchange area. If call-extending is not provided from the PSAP, a second trunk is eligible if 1000 or more main stations are located in the exchange area.

2. The recurring equipment and trunking costs associated with providing selective routing service for all exchanges that, without selective routing, would generate at least five redirected 911 calls per day. Should the number of redirected 911 calls be impossible to define by measurement, the following formula shall be used:

$$\frac{A \times B \times C}{1000} = \text{Number of redirected calls per day.}$$

a. "A" equals the population living in that part of a telephone exchange geographic area not normally served by communications personnel at the public safety answering point. (This figure can be determined by using census tract data or other appropriate means.)

b. "B" equals the number of 911 telephone calls per 1,000 population per day in the geographic area of the telephone exchange. If that number is not available, the following method shall be used for estimating that number:

(1) Three (3) for all cities of the first class (as defined in Minn. Stat. § 410.01), or if the telephone exchange is located within ten air miles of the corporate boundaries of a city of the first class.

(2) Two (2) for an exchange located within a city containing a population of 25,000 or more, but not a city within ten air miles of a city of the first class; for an exchange located within five air miles of the corporate boundaries of a city with a population of 25,000 or greater, or for those exchanges located more than ten but less than fifteen air miles from the corporate boundaries of a city of a first class. Determination of population shall be based upon the most current estimates of the State Demographer. If such estimates are not available, population shall be based upon the latest federal or special census.

(3) One (1) for exchanges in those areas of the state not falling within the above classification.

c. "C" equals the ratio of the number of 911 calls that will require redirection to the total number of 911 calls originating from that part of the telephone exchange geographic area not normally served by communications personnel at the PSAP.

3. A county may petition the Department of Administration for state payment of selective routing costs for those exchanges which do not qualify for funding under 2 MCAR § 1.6114 B. 2. Such petition will be considered as an application for variance and shall comply with the provisions contained in 2 MCAR § 1.6110 A. The Department of Administration shall evaluate such a request pursuant to the provisions of 2 MCAR §§ 1.6110 C.-F. and shall grant a variance upon a clear showing by the petitioner of the following factors:

a. Extraordinary circumstances affecting the provisions of emergency services such as the following:

(1) Land use characteristics including, but not limited to residential, commercial, and industrial uses, the assessed valuation of the area, and reasonable population projections for a five year period.

(2) Population characteristics including, but not limited to, population densities by discreet period of time per day and by season of the year.

(3) Public Safety factors causing unique or unusual problems including, but not limited to, natural and transportation barriers to effective service, the legal service boundaries of public safety agencies; and facilities or sites with unusual or potential high-risk public safety hazards.

b. The Department of Administration's assumption of such payments results in a clear and significant improvement in public safety.

C. In any telephone exchange having the technological capacity for generating ANI information, the cost of transmitting such information from the originating exchange to the primary PSAP shall be eligible for state payment.

2 MCAR § 1.6115 Funding eligibility/payment of central office modification costs. The state shall pay the capital and installation costs associated with modification of telephone company central office switching equipment necessary to properly route a call that was placed by dialing 911. Payment shall be subject to the following provisions:

A. Sufficient documentation shall be furnished by the telephone companies to provide for certification by the Department of Public Service that the modifications and the costs therefore are reasonable.

B. Payment shall be made in accordance with Minn. Stat. § 403.11.

Chapter 16 Procurement

§ 1.6501

A. Scope: Pursuant to Minn. Stat. Ch. 16, these rules govern the procurement of materials and services for the state under the competitive bidding requirements.

B. Definitions: Within 2 MCAR §§ 1.6501-1.6804, the following apply, unless clearly indicated otherwise by the context:

1. "Division of Procurement" means Division of Procurement, Department of Administration, Room 112, State Administration Building, 50 Sherburne Avenue, St. Paul, Minnesota 55155.

2. "Director" means Director of the Division of Procurement.

3. "Liquidated damages" means a specific sum of money, agreed to as part of a contract to be paid by one party to the other in the event of breach of contract in lieu of actual damages, unless otherwise provided by law.

4. "Material variance" means a variance in a bid from specifications or conditions which allows a bidder a substantial advantage or benefit not enjoyed by all other bidders.

5. "Newspaper of general circulation" means Finance and Commerce for general commodities and services and Construction Bulletin for construction projects, or an alternate approved by the Director.

6. "Responsible Bidder" means a bidder who

a. is a manufacturer of, regular dealer in, or an agent of a manufacturer of supplies of the general character to be furnished; or

b. is in the business of furnishing the services to be provided; and

c. is financially and otherwise able to perform the contract, as evidenced by integrity, ability, skill, experience, and performance of past contracts for the state or other purchasers; and

d. is otherwise qualified under law and rule, including incorporation or registration to do business in the State of Minnesota; and

e. is in compliance with all tax laws thereof.

§ 1.6502 Method of bidding.

A. Any purchase estimated to exceed $5,000.00 shall be purchased on sealed bids, notice of solicitation of bid to be inserted once in a newspaper of general circulation at least seven (7) days prior to the bid opening date. Bids

shall also be solicited by sending bid invitations to all prospective bidders registered with the Division of Procurement pursuant to 2 MCAR § 1.6502 C. and by posting notice on a public bulletin board in the Division of Procurement Office at least five (5) days prior to the bid opening date.

B. Any purchase estimated to be $5,000.00 or less may be made upon competitive bids or in the open market, but in either case will be based on three (3) competitive bids, so far as practicable.

C. A list of bidders shall be maintained by the Division of Procurement for various commodity classes. Any persons desiring to sell supplies to the state may file with the Director of Procurement a letter showing their business address, the commodities they desire to sell to the state, and proof of incorporation or registration to do business in the state. The firm name shall then be placed on the permanent bid list to receive invitations to bid. The name of a bidder who fails to respond to three (3) consecutive bid invitations shall be removed from the list of bidders upon written notice. The name of the bidder so removed shall be restored only by specific written request.

D. Submission of advertised bids.

1. Each invitation to bid shall include the following information and any other relevant information required by the nature of the individual bid, as called for in the bid specifications.

a. Department, Division, and requisition number;

b. name and address of using agency;

c. date of issuance;

d. time and place of delivery of bid;

e. date, hour, and place for opening bids;

f. security requirements, if any;

g. quantity of supplies and/or services to be furnished;

h. description of supplies and/or services to be furnished;

i. place, method, and conditions of inspection or testing, if required;

j. applicable general and special conditions.

2. General bid conditions. Bid conditions applicable to all state purchases shall be stated on the standard invitation to bid.

3. Special bid conditions. Bid conditions applicable to specific commodities or types of purchase shall be stated in the invitation to bid. Special conditions supersede general conditions, if conflicting.

4. Bids shall be completed, signed, and submitted by each bidder in accordance with the instructions contained in each invitation for bid. Telegraphic bids shall not be considered unless expressly permitted in the invitation to bid. Bids shall be delivered to the Division of Procurement at address shown on bid invitation.

5. In each instance, the bids shall be on the form provided, in a sealed bid envelope or an envelope clearly identified with the commodity, time and date of opening, and the name of bidder on the front of the envelope.

§ 1.6503 Bid security.

A. Each bid invitation shall set forth the bid security required by the Division. Such bid security shall be made payable to "State of Minnesota" and shall be made upon the condition or guarantee that in the event the bidder's offer is accepted, the bidder shall enter into contract in accordance with the proposal.

B. Certified checks or bid bonds of successful bidders shall constitute liquidated damages for failure of a bidder to enter into a contract, and shall also be held as security for delivery and acceptance of merchandise, or satisfactory completion of the contract. A performance bond for twenty-five percent (25%) of the award may be substituted.

C. Checks of unsuccessful bidders shall be returned to vendor by placing them in the mail within five (5) working days after an award is made. Checks of successful vendors shall be returned as soon as delivery is completed and acceptance is made by the agency, or the contract is satisfactorily completed. No interest shall be paid on any monies held as security.

D. Annual bid and supply bond.

1. Bidders may file with the Director of Procurement an annual bid and supply bond in lieu of individual bonds or other security required in various individual bid invitations.

2. Annual bid and supply bonds, when accepted by the Director of Procurement, shall cover all bids by the vendor for materials, commodities, and supplies during the effective period of the annual bond, except as provided in 2 MCAR § 1.6503 D. 3.

3. Annual bid and supply bonds shall not cover bid:

a. for building construction, repair, remodeling or other public works;

b. on which the annual bid security does not amount to 5% of the bid;

c. when another bond is required by specification; or

d. when bond is used as security on other bids.

4. The vendor shall be notified in writing if the necessity arises to attach the bond for breach of contract.

§ 1.6504 Opening of bids.

A. Upon receipt in the Division of Procurement, all bids will be time stamped, showing the date and hour received. Bids received after the time set for the opening of bids will be returned unopened to the bidders. Bids shall be opened publicly and read aloud at the time and place established in the bid invitation. All original bids will be retained pursuant to Minn. Stat. § 16.07, subd. 2, for public inspection in the Division of Procurement.

B. Recording and tabulation of bids. The names of bidders, prices bid, and other pertinent data shall be recorded on a tabulation form which shall be available for public inspection in the Division of Procurement.

C. Rejection of bids. The state may reject any or all bids or portions thereof. All bids shall be rejected for good and sufficient cause, including but not limited to, abandonment of the project by the state, or insufficient state funds.

D. A vendor whose sealed bid is rejected shall be given notice of the rejection and the reason(s) for rejection of the bid.

E. Informalities and minor deficiencies. The state reserves the right to waive minor deficiencies or informalities in bids. Minor informalities shall be waived if, in the judgment of the Director of Procurement, the best interest of the state would be served without prejudice to the rights of the other bidders. Examples of minor deficiencies include, but are not limited to:

1. omission of the title of the signatory;

2. failure to furnish required catalog cuts;

3. minor detail omissions.

§ 1.6505 Award.

A. Award of contracts shall be made in conformity with Minn. Stat. § 16.08 and with no material variance from the terms and conditions of the bid invitation.

§ 1.6506 Tie bids.

A. Tied low bids for less than $500.00 shall be resolved by drawing lots among the tied low bidders, except as provided in 2 MCAR § 1.6506 C.

B. Except as provided in 2 MCAR § 1.6506 C., tied low bids for $500.00

or more shall be referred to the Director or Assistant Director of Procurement for disposition. The Director of Procurement may enter into negotiation with tied low bidders when the Director deems such action to be in the best interest of the State.

C. Whenever a tie involves a Minnesota firm and one whose place of business is outside the State of Minnesota, preference shall be given to the Minnesota firm.

§ 1.6507 Contract performance.

A. The Director of Procurement or authorized agents of state departments shall place orders with successful bidders using official state purchase orders.

B. Upon award, shipment shall be made in accordance with delivery instructions in the invitation to bid.

C. All deliveries shall conform to specifications of the bid. Failure in this respect shall be cause for rejection of the goods.

D. Commodities that fail to comply with specifications, fail to conform to the vendor's sample, are not as provided on the purchase order, or arrive in an unsatisfactory condition shall be rejected except as provided in 2 MCAR § 1.6507 H. 2.

E. Notice of rejection, based upon apparent deficiencies disclosed by ordinary methods of inspection, shall be given by the receiving agency to both vendor and the carrier (if FOB shipping point) within reasonable time after delivery, with a copy of this notice to the Division of Procurement. Revocation of acceptance for latent deficiencies that would make the items unsatisfactory for the purpose intended shall be given by the state within reasonable time after discovery. The contractor shall satisfactorily repair or replace such items within a reasonable period of time.

F. The state may require that the vendor permit inspection of the commodities prior to shipment at the factory, plant, or establishment where produced, manufactured, or stored. Unless provision for inspection is made in the invitation to bid, costs thereby incurred will be paid by the state.

G. The vendor shall forthwith remove at his expense any item rejected by the state. If the vendor fails to remove such an item, or to forthwith forward shipping instructions to the agency concerned, the state may sell the item and remit the proceeds of sale, less the expense involved, in accordance with law including but not limited to Minn. Stat. § 336.2-603.

H. If the needs of a state agency do not permit time to replace rejected merchandise, or if deliveries are not made within the time specified in the contract, the agency may:

1. With the approval of the Director of Procurement, buy on the open

market supplies of the nature required. The vendor shall be liable for all additional costs and expenses.

2. If it is determined that an item does not conform strictly to specifications, but can be used satisfactorily, the Director of Procurement may adjust the price with written acquiescence of the vendor, and authorize the agency to keep and use such part of the order when such action is required to sustain continued operation.

I. The Director of Procurement may direct that a laboratory analysis or other tests be made to determine the acceptability of the delivered product(s) and to insure that product(s) meet specifications. In these instances, acceptance by the state shall not occur nor be deemed to have been made, and the discount time shall not begin, until testing is completed and affirmative results are obtained. Vendors shall be notified of unsatisfactory test results.

§ 1.6508 Failure to perform.

A. If a bidder who is awarded a contract fails to perform as specified, the bid security shall be retained by the state and deposited with the State Treasurer as liquidated damages. The vendor may also be determined not to be a responsible bidder. The state may also pursue all other remedies permitted or provided by law.

B. If the bid security is in the form of a bond, the bonding company shall be notified in writing of the default. A vendor who fails to enter into contract that has been awarded to him may be determined not to be a responsible bidder regardless of whether bid security was required. The state may seek further damages and shall not be limited by the absence or existence of a bond.

C. After the award of a contract, if the vendor fails to furnish satisfactory performance security, if required, the vendor shall be deemed in default and subject to the above provisions.

D. A vendor shall be held in default for failure to conform to bid specifications or standard commercial practices including, but not limited to the following:

1. failure to make deliveries within the time specified in the contract; or

2. deliveries of goods or materials that do not conform to samples or specifications, and are not promptly replaced or

3. delivery of goods or materials that are repeatedly rejected; or

4. misbranding or materially misrepresenting goods or materials purchased under the contract.

E. In all cases of default, the vendor may be determined not to be a responsible bidder.

§ 1.6509 Contract cancellation.

A. The Director of Procurement may cancel a purchase entered into under competitive bidding under any one of the following conditions including, but not limited to:

1. the contractor agrees to the cancellation;

2. the contractor has obtained the contract by fraud, collusion, conspiracy, or in conflict with any statutory or constitutional provision of the State of Minnesota;

3. failure to deliver as agreed.

§ 1.6510 Bidder errors.

A. Prior to the opening of sealed bids, any person may withdraw his bid by notifying the Director in writing of his desire to withdraw, by appearing in person at the Division of Procurement's Office and withdrawing the bid, or by telegraphic writing received by the Director requesting withdrawal of his bid.

B. Subsequent to the opening of sealed bids, a person may withdraw his bid only upon a showing that an obvious error exists in the bid. The showing and request for withdrawal must be made in writing to the Director within a reasonable time after the opening of the bids and prior to the state's detrimental reliance on the bid.

2 MCAR S 1.6601 Sheltered workshop.

A. Any sheltered workshop wishing to apply to receive notice of available state contracts pursuant to Minnesota Statutes Section 16.281, shall apply in writing to Director, Minnesota Association of Rehabilitation Facilities.

2 MCAR S 1.6701 Purpose, scope, definitions.

A. Purpose: 2 MCAR SS 1.6701-1.6705 are promulgated pursuant to Minn. Stat. SS 16.081-16.086 and Minn. Stat. S 645.445 for the purpose of establishing procedures relating to the small business and small business owned by socially or economically disadvantaged persons set-aside program administered by the Division of Procurement, Department of Administration, 50 Sherburne Avenue, St. Paul, Minnesota 55155. 2 MCAR SS 1.6501-1.6601 shall also govern procurement under this program.

B. Scope: In the event of irreconcilable conflict between the general procurement rules in 2 MCAR SS 1.6501-1.6601 and these rules relating specifically to the set-aside program, the rules of the set-aside program shall govern.

C. Definitions: The definitions contained in Minn. Stat. S 645.445 shall apply in the administration of the set-aside program. In addition, the following definitions shall apply:

1. The terms "racial minorities", "women" and "persons who have suffered a substantial physical disability" contained in Minn. Stat. S 645.445, subd. 5 shall have the following meanings:

a. "Racial minorities" - All persons in one or more of the following categories:

(1) Black (not of Hispanic origin) - All persons having origins in any of the Black racial groups of Africa;

(2) Hispanic - All persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;

(3) Asian or Pacific Islander - all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent or the Pacific Islands. This area includes, but is not limited to, China, Vietnam, Japan, Korea, the Phillippine Islands, and Samoa;

(4) Alaska Native - All persons having origins in any of the original peoples of North America and who maintain cultural identification through tribal affiliation;

(5) "Indian" - An individual having origins in any

of the original people of North America who is an enrolled member of an Indian tribe recognized as such by the government of the United States and Canada.

b. "Women" - All persons of the female gender;

c. "Persons who have suffered a substantial physical disability" - All persons suffering a physical impairment that is likely to cause difficulty in securing, retaining and/or advancing in employment, and that substantially limits one or more of his or her major life activities, including but not limited to visual, hearing or special learning impairments.

2. "A small business owned and operated by a socially or economically disadvantaged person(s)" means a small business as defined in Minn. Stat. S 645.445, subd. 2 which is 51% owned and operated on a day-to-day basis by a socially or economically disadvantaged person as defined in Minn. Stat. S 645.455, subd. 5.

3. "Manufacturer" means a business that makes and/or processes raw materials into a finished product;

4. "Manufacturer's representative" means a business that has a written agreement or agreements with one or more manufacturers to sell the products of such manufacturer(s), but that is not an employee of such manufacturer(s);

5. "Dealer, jobber or distributor" means a business that maintains a store, warehouse or other establishment in which a line or lines of products are kept in inventory and are sold to the public on a wholesale and/or retail basis;

6. "Contractor" means a business that is engaged in construction including but not limited to general, mechanical, and/or electrical contracting, or that provides a specific service including but not limited to trash removal, snow removal, janitorial services;

7. "Joint venture" means the association of two or more businesses, all of which are certified businesses in the small business and/or small business owned and operated by socially and economically disadvantaged persons program, for the purpose of receiving a procurement bid award;

8. "Broker" means a business that carries no inventory and that has no written agreement with any manufacturer to sell the products of such manufacturer;

9. "Third-party lessor" means a business that as a lessee acts as a lessor to a third party.

2 MCAR S 1.6702 Eligibility for set-aside program.

556 560 A. The following businesses shall be eligible for

participation in the set-aside program: manufacturer, manufacturer's representative, dealer, jobber, distributor, contractor, and businesses engaged in a joint venture.

B. The following businesses shall not be eligible for participation in the set-aside program: brokers and third-party lessors.

2 MCAR S 1.6703 Self-certification of eligibility.

A. To become eligible to receive invitations for set-aside bids, each business shall certify and file with the Division of Procurement the following information on the application forms provided:

1. name and address of applicant and principal place of business;

2. whether applicant is applying for designation as a small business or a small business owned and operated by a socially or economically disadvantaged person(s); designation shall be made as to the type of business operated and the kinds of service, materials, or supplies which can be delivered;

3. number of employees;

4. gross revenues in the preceding fiscal year;

5. whether the business is an affiliate or subsidiary of a business dominant in its field of operation;

6. listing of all owners, including percentage of ownership, and all officers of the applicant with full disclosure of all owners' and officers' direct and indirect involvement in other businesses and enterprises which are in the same field of operation as the applicant, unless ownership is by common stock regularly bought and sold through recognized exchanges;

7. all other relevant information requested by the division.

B. If the applicant is certifying itself for designation as a business owned and operated by socially or economically disadvantaged persons, the applicant shall also provide information indicating the basis of claim for designation under the standards established by Minn. Stat. S 645.445, subd. 5 and these rules for each officer and owner of the business.

C. To assist in verification of the self-certification, the Division of Procurement on behalf of the Commissioner of Administration shall require each business to submit a copy of its income statement for the preceding fiscal year as well as a statement of the number of employees. If a business does not have one year's experience, it shall indicate the date the

business was organized and provide an income statement for that period since the business was organized.

D. The Director of the Division of Procurement shall be notified in writing of any and all changes in the applicant's business which may alter the information provided above within thirty (30) days of such change(s).

E. Each applicant shall be notified in writing of the acceptance or rejection of the application, within 30 days of receipt of the self-certification form by the Division of Procurement. An application shall be rejected on any of the following grounds:

1. Applicant is dominant in its field of operation or is an affiliate or subsidiary of a business dominant in its field of operation;

2. Applicant has failed to provide all relevant required information;

3. Where applying for designation as a business owned and operated by socially or economically disadvantaged person(s), applicant failed to establish that majority ownership and operating control are held by socially or economically disadvantaged person(s);

4. Applicant has failed to comply with laws and rules of the state relating to procurement;

5. Applicant's failure to comply with the requirements of these rules or Minn. Stat. S 16.083, et seq. faith in application for inclusion in this program;

6. Applicant is a broker and/or third-party lessor.

F. After an applicant has received written notice of rejection of its application to participate in the set-aside program, applicant may appeal this decision in writing to the Director of the Division of Procurement within thirty (30) days of receipt of such notice. The director shall render a decision in writing on the application within thirty (30) days of receipt of the appeal. If the applicant's rejection is sustained by the director, applicant may appeal this decision in writing to the Commissioner of Administration within thirty (30) days of receipt of such determination. The commissioner shall render the final decision in writing within thirty (30) days of receipt of such appeal.

2 MCAR 1.6704 Establishment of set-aside procurements.

A. A list of set-aside businesses, properly certified pursuant to 2 MCAR S 1.6703 shall be established and maintained by the Division for various commodity classes.

B. Determination of contracts for set-aside. When a requisition is received by the Division of Procurement and is placed on the list of set-aside contracts, the contract for a particular commodity shall be offered to those businesses on that commodity list and awarded as follows:

1. For all such requisitions, the Division of Procurement shall establish an estimated price for the goods or services;

2. All businesses on the set-aside list shall be notified of the estimated price;

3. First attempt at purchase shall be made from a small business owned and operated by a socially or economically disadvantaged person(s);

4. Where there is only one business in a given commodity class the business shall be invited to submit a bid based on the estimated price;

5. Where there are two or more businesses in a given commodity class, competitive bids shall be obtained;

6. Acceptable bids shall be recorded and the award made to the lowest responsible bidder;

7. No award shall be made when the low bid is more than 5% over the estimated price;

8. Where there are no bids or no acceptable bids, unsatisfactory bids, if any, will be recorded and the requisition shall thereafter be rebid through normal procurement procedures;

9. If it is necessary to reject original bids and the bid specifications are substantially changed or were in error, specifications shall be revised and the project rebid under set-aside rules;

10. If an acceptable bid is received and awarded under normal procurement procedures, the cost or price shall be recorded for report purposes.

2 MCAR S 1.6705 General terms and conditions.

A. A business which, if offered an award, finds that it cannot produce, supply or construct according to the bid terms and conditions shall, within seven (7) calendar days after receipt of notice as low bidder, notify the Division of Procurement in writing of the reasons therefor.

B. When the Commissioner of Administration finds that the low bidder is unable to perform, the Department of Economic Development shall be notified by the Division of Procurement in accordance with Minnesota Statutues Section 16.084, so that the

Commissioner of Economic Development can assist the small business in attempting to remedy the causes of the inability to perform.

C. Failure to enter into the contract or to accept an offered award will not automatically disqualify a business from further bidding.

D. The records of the Procurement Division shall show the reason(s) for such failure.

E. A business shall be removed from the set-aside list and disqualified from further bidding on any set-aside contract for failure to satisfactorily complete and fulfill the terms and conditions of a set-aside contract after an award has been made and accepted. Notice of removal and disqualification and the reasons therefor shall be provided in writing to the business by the Division of Procurement and shall be effective thirty (30) days after receipt by the business. Disqualification shall remain in effect until the business documents in writing the corrections made and the steps taken to assure performance of future contracts. Such documentation shall be directed to the Director, Division of Procurement.

F. A business shall be removed from the set-aside list and disqualified from further bidding on any set-aside contract when the business no longer qualifies for the set-aside program pursuant to Minn. Stat. SS 16.081-16.086, Minn. Stat. S 645.455 and these rules. Notice of such removal and the reasons therefor shall be provided in writing to the business by the Division of Procurement and shall be effective upon receipt by the business.

G. When a business is removed from the set-aside list and disqualified from further bidding on any set-aside contract the business may appeal such removal and disqualification according to the procedure described in 2 MCAR S 1.6703 F.

H. The Director of the Division of Procurement may divide bid invitations by dollar amounts, units of production, or duration of contract to facilitate awarding contracts to business in the set-aside program.

I. No contractor awarded a contract under the set-aside program shall subcontract fifty percent (50%) or more of the dollar value of the work under such contract. In construction contracts, the amount of specialty subcontracting shall be excluded in determining the total amount of permissible subcontracting.

§ 1.6801 State-funded partial indemnification of small businesses and small businesses owned by economically and socially disadvantaged persons. Pursuant to Minn. Stat. § 574.262 (1977), 2 MCAR §§ 1.6801-1.6804 establish procedures relating to state funding of partial indemnification for certain state contractors which are small businesses and small businesses owned by economically and socially disadvantaged persons. Rules establishing eligibility standards are exempted from the providions of Minn. Stat. Ch. 15.

§ 1.6802. Any person, corporation, or other legal entity wishing to apply for partial indemnification shall contact the Division of Procurement, State Administration Building, 50 Sherburne Avenue, St. Paul, Minnesota 55155. The application for determination of eligibility shall include the following:

1. a current certified financial statement or equivalent approved by the Director;

2. reasons for requesting partial indemnification;

3. a list of all bonding companies contacted;

4. copies of all denials of application(s) for bonding received from bonding companies or bonding agencies;

5. a summary of all other efforts undertaken to obtain bonding;

6. all other relevant information requested.

§ 1.6803. Upon receipt of an application for determination of eligibility, the Commissioner shall make an eligibility determination and notify the applicant within a reasonable time.

§ 1.6804. Participation in partial indemnification pursuant to these rules shall be restricted or limited as set forth in Minn. Stat. § 574.262, subd. 2.

insert new:
2 MCAR SS 1.8001-
1.8023, AR022757

2 MCAR S 1.90101 Authorization. Rules 2 MCAR SS 1.90101-1.90906 are authorized by Minnesota Statutes, sections 327.31 to 327.36; and 327.55 and established through the rulemaking procedures set forth in Minnesota Statutes, sections 15.0411 to 15.0417, to implement, interpret, and carry out the provisions of Minnesota Statutes, sections 327.31 to 327.36; and 327.55 relating to manufactured homes. If these rules differ from the code promulgated by the American National Standards Institute as ANSI A119.1, or the provisions of the National Fire Protection Association identified as NFPA 501B, these rules shall govern in all cases.

2 MCAR S 1.90102 Enforcement. The commissioner shall administer and enforce all the provisions of 2 MCAR SS 1.90101-1.90906 and the code. Any authorized representative of the Department of Administration may enter any premises where manufactured homes are manufactured, sold, offered for sale, parked in any manufactured home park in the state, or installed in the state if the installation was made after September 1, 1974. The authorized representative may examine any records and may inspect any manufactured home, equipment, or installations to ensure compliance with the provisions of 2 MCAR SS 1.90101-1.90906 and the code. The authorized representative may require that a portion or portions of a manufactured home be removed or exposed in order that an inspection may be made to determine compliance, or require that all portions of an installation be removed or exposed to make this determination.

2 MCAR S 1.90103 Definitions.

A. Applicability. For the purposes of 2 MCAR SS 1.90101-1.90906, the terms defined in B.-GGG. have the meanings given them.

B. Accessory structure. "Accessory structure" means manufactured home accessory structure.

C. Act. "Act" means the National Manufactured Housing Construction and Safety Standards Act of 1974, title VI of the Housing and Community Development Act of 1974, United States Code, title 42, sections 5401-5426 (1976), as amended through March 15, 1982.

D. Anchor. "Anchor" means ground anchor.

E. Anchoring equipment. "Anchoring equipment" means straps, cables, turnbuckles, and chains, including tensioning devices, which are used with ties to secure a manufactured home to ground anchors.

F. Anchoring system. "Anchoring system" means any method used for securing the manufactured home to a foundation system or the ground.

G. Approved. "Approved" means acceptable to the authority having jurisdiction.

H. Authority having jurisdiction. "Authority having jurisdiction" means the Commissioner of Administration or his authorized representative.

I. Authorized representative. "Authorized representative" means any person, firm, or corporation, or employee thereof, approved or hired by the commissioner to perform inspection services.

J. Baling. "Baling" means a method of "wrapping" a cross section (roof, walls, and floor) and the main frame (chassis) of a manufactured home with straps.

K. Code. "Code" means the manufactured home building code.

L. Commissioner. "Commissioner" means the Commissioner of Administration or his duly authorized representative.

M. Construction alteration. "Construction alteration" means the replacement, addition, modification, or removal of any equipment or installation which may affect the construction, plumbing, heating, cooling, or fuel burning system, or electrical system or the functioning of any of these in manufactured homes subject to the code.

N. Construction compliance certificate. "Construction compliance certificate" means the certificate provided by the manufacturer or dealer to both the commissioner and the owner which warrants that the manufactured home complies with the code.

O. Dealer. "Dealer" means any person engaged in the sale, leasing, or distribution of a manufactured home primarily to persons who purchase or lease for purposes other than resale.

P. Defect. "Defect" means a failure to comply with an applicable federal mobile home construction and safety standard, as set forth in Code of Federal Regulations, title 24, part 3280 (1981), that renders the manufactured home or any part or component of it not fit for the ordinary use for which it was intended, but that does not result in an unreasonable risk of injury or death to occupants of the manufactured home.

Q. Design approval inspection agency. "Design approval inspection agency" means a state or private organization that has been accepted by the secretary.

R. Diagonal tie. "Diagonal tie" means a tie intended primarily to resist horizontal or shear forces and which may secondarily resist vertical, uplift, and overturning forces.

S. Distributor. "Distributor" means any person engaged in the sale and distribution of manufactured homes for resale.

T. Evaluation agency. "Evaluation agency" means an organization approved by the commissioner which is qualified by reason of facilities, personnel, experience, and demonstrated reliability to investigate and evaluate manufactured homes.

U. Failure to conform. "Failure to conform" includes noncompliance, having a defect or serious defect, and having an imminent safety hazard related to failure to comply with an applicable federal mobile home construction and safety standard in Code of Federal Regulations, title 42, part 3280 (1981). "Failure to conform" is used as a substitute for all of those terms.

V. Footing. "Footing" means that portion of the support system that transmits loads directly to the soil.

W. Foundation system. "Foundation system" means a permanent foundation constructed in conformance with the state building code.

X. Ground anchor. "Ground anchor" means any device at the manufactured home stand designed to transfer manufactured home anchoring loads to the ground.

Y. Imminent safety hazard. "Imminent safety hazard" means a hazard that presents an imminent and unreasonable risk of death or severe personal injury that may or may not be related to failure to comply with an applicable federal mobile home construction and safety standard in Code of Federal Regulations, title 42, part 3280 (1981).

Z. Independent inspection agency. "Independent inspection agency" means an organization approved by the commissioner qualified to review and approve plans and specifications for manufactured homes with respect to model, structural, electrical, mechanical, and plumbing requirements and to evaluate quality control programs and make inspections.

AA. Installation. "Installation" of a manufactured home means assembly, at the site of occupancy, of all portions of the manufactured home, connection of the manufactured home to existing utility connections, and installation of support or anchoring systems.

BB. Installation alteration. "Installation alteration" means the replacement, addition, modification, or removal of any components of the ground support or ground anchoring systems required under the provisions of 2 MCAR SS 1.90101-1.90906.

CC. Installation compliance certificate. "Installation compliance certificate" means the certificate provided by the installer to both the commissioner and the owner which warrants that the manufactured home complies with 2 MCAR SS 1.90101-1.90906.

DD. Installation instructions. "Installation instructions"

means those instructions provided by the manufacturer accompanying each manufactured home detailing the manufacturer's requirements for ground supports and anchoring systems attachments.

EE. Installation seal. "Installation seal" means a device or insignia issued by the commissioner to a manufactured home installer to be displayed on the manufactured home to evidence compliance with the commissioner's rules pertaining to manufactured home installations.

FF. Installer. "Installer" means manufactured home installer.

GG. Label. "Label" means the approved form of certification required by the secretary or the secretary's agents to be affixed to each transportable section of each manufactured home manufactured for sale, after June 14, 1976, to a purchaser in the United States.

HH. Length of a manufactured home. "Length of a manufactured home" means its largest overall length in the traveling mode, including cabinets and other projections which contain interior space. Length does not include bay windows, roof projections, overhangs, or eaves under which there is no interior space, nor does it include drawbars, couplings, or hitches.

II. Listed. "Listed" means equipment or materials included in a list published by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

JJ. Listing agency. "Listing agency" means an agency approved by the commissioner which is in the business of listing or labeling and which maintains a periodic inspection program on current production of listed products, and which makes available at least an annual published report of the listing which includes specific information that the product has been tested to approved standards and found safe for use in a specified manner.

KK. Main frame. "Main frame" means the structural component on which is mounted the body of the manufactured home.

LL. Manufactured home. "Manufactured home" means a structure, transportable in one or more sections, which in the traveling mode is eight body feet or more in width or 40 body feet or more in length, or, when erected on site, is 320 or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning, and electrical

systems contained therein; except that the term includes any structure which meets all the requirements and with respect to which the manufacturer voluntarily files a certification required by the secretary and complies with the standards established under Minnesota Statutes, chapter 327.

MM. Manufactured home accessory structure. "Manufactured home accessory structure" means a factory-built building or structure which is an addition or supplement to a manufactured home and, when installed, becomes a part of the manufactured home.

NN. Manufactured home building code. "Manufactured home building code" means for manufactured homes manufactured after July 1, 1972, and prior to June 15, 1976, the standards code promulgated by the American National Standards Institute and identified as ANSI A119.1, including all revisions thereof in effect on May 21, 1971, or the provisions of the National Fire Protection Association and identified as NFPA 501B, and further revisions adopted by the commissioner.

"Manufactured home building code" means for manufactured homes constructed after June 14, 1976, the mobile home construction and safety standards promulgated by the United States Department of Housing and Urban Development which are in effect at the time of the manufactured home's manufacture.

OO. Manufactured home installer. "Manufactured home installer" means any person, firm, or corporation which installs manufactured homes for others at site of occupancy, except manufactured homes installed on a foundation system.

PP. Manufacturer. "Manufacturer" means any person engaged in manufacturing or assembling manufactured homes, including any person engaged in importing manufactured homes for sale.

QQ. Mobile home. "Mobile home" is synonymous with manufactured home whenever it appears in 2 MCAR SS 1.90101-1.90906 and in other documents or on construction or installation seals.

RR. Model group. "Model group" means two or more manufacturer-designed accessory structures which constitute one model.

SS. Noncompliance. "Noncompliance" means a failure of a manufactured home to comply with a federal mobile home construction or safety standard that does not constitute a defect, serious defect, or imminent safety hazard.

TT. Person. "Person" means a person, partnership, corporation, or other legal entity.

UU. Production inspection primary inspection agency. "Production inspection primary inspection agency" means an agency which evaluates the ability of manufactured home

manufacturing plants to follow approved quality control procedures and which provides ongoing surveillance of the manufacturing process.

VV. Purchaser. "Purchaser" means the first person purchasing a manufactured home in good faith for purposes other than resale.

WW. Seal. "Seal" means a device or insignia issued by the commissioner to be displayed on the manufactured home to evidence compliance with the manufactured home building code. "Seal" includes construction and installation seals.

XX. Secretary. "Secretary" means the Secretary of the United States Department of Housing and Urban Development or the head of any successor agency with responsibility for enforcement of federal laws relating to manufactured homes.

YY. Serious defect. "Serious defect" means any failure to comply with an applicable federal mobile home construction and safety standard in Code of Federal Regulations, title 24, part 3280 (1981) that renders the manufactured home or any part of it not fit for the ordinary use for which it was intended and which results in an unreasonable risk of injury or death to occupants of the affected manufactured home.

ZZ. Stabilizing devices. "Stabilizing devices" means all components of the anchoring and support systems such as piers, footings, ties, anchoring equipment, ground anchors, and any other equipment which supports the manufactured home and secures it to the ground.

AAA. Stabilizing system. "Stabilizing system" means a combination of the anchoring system and the support system when properly installed.

BBB. State administrative agency. "State administrative agency" means an agency of a state which has been approved or conditionally approved to carry out the state plan for enforcement of the federal mobile home construction and safety standards. For manufactured homes manufactured after June 14, 1976, and located in Minnesota, the commissioner of administration is the state administrative agency.

CCC. Support system. "Support system" means any foundation system or other structural method used for the purpose of supporting a manufactured home at the site of occupancy.

DDD. Testing agency. "Testing agency" means an organization which:

1. Is primarily interested in testing and evaluating equipment and installations;

2. Is qualified and equipped to observe experimental testing to approved standards;

3. Is not under the jurisdiction or control of any manufacturer or supplier of any industry;

4. Makes available a published report in which specific information is included stating that the equipment and installations listed or labeled have been tested and found safe for use in a specific manner; and

5. Is approved by the commissioner.

EEE. Tie. "Tie" means a strap, cable, or securing device used to connect the manufactured home to ground anchors.

FFF. Utility connections. "Utility connections" means the connection of the manufactured home to existing utilities including, but not limited to, electricity, water, sewer, gas, or fuel oil.

GGG. Vertical tie. "Vertical tie" means a tie intended primarily to resist the uplifting and overturning forces.

HHH. Width of a manufactured home. "Width of a manufactured home" means its largest overall width in the traveling mode, including cabinets and other projections which contain interior space. Width does not include bay windows, roof projections, overhangs, or eaves under which there is no interior space.

2 MCAR S 1.90201 Requirement for seals, code compliance, construction compliance certificates, or labels.

A. Construction seals; code compliance; construction compliance certificates; or labels. After July 1, 1972, no person shall sell or offer for sale in this state any manufactured home manufactured after July 1, 1972; manufacture any manufactured home in this state; or park any manufactured home manufactured after July 1, 1972, in any manufactured home park in this state, unless the manufactured home complies with the code and the commissioner's revisions to it, bears a construction seal issued by the commissioner, and is accompanied by a construction compliance certificate by the manufacturer or dealer, on a form issued by the commissioner, both evidencing that it complies with the code, or if manufactured after June 14, 1976, bears a label as required by the secretary.

B. Alteration of manufactured homes required to have a construction seal or label. After July 1, 1972, no person shall alter any manufactured home bearing, or required to bear, a construction seal or label as provided in A. unless the person has complied with 2 MCAR S 1.90701.

C. Requirement for installation seals.

1. No person shall install or connect to any manufactured home or manufactured home accessory structure a ground support or anchoring system unless the system and installation comply

with these rules. The installer shall affix the correct installation seals to the manufactured home or the manufactured home accessory structure installed in compliance with 2 MCAR SS 1.90101-1.90906. Evidence of compliance shall be supported by the submission of a certificate to the commissioner and the manufactured home owner. Installation seals are not required for manufactured homes installed on a foundation system. A permit to install a manufactured home in a municipality enforcing the state building code may be required by the municipality.

2. When climatic conditions interfere with the completion of installation, the dealer or installer will assign an installation seal for the manufactured home incompletely installed and notify the commissioner stating the condition prohibiting the completion of the installation using the form issued by the commissioner. A copy of this notice shall be provided to the owner. When climatic conditions permit the completion of installation, the installation will be promptly completed and the installation seal affixed to the manufactured home. The installation compliance certificate shall be provided to the commissioner and the owner.

D. Requirement for manufactured home accessory structure seal. No person shall install or connect to any manufactured home a subordinate structure manufactured after September 1, 1974, unless the accessory structure complies with 2 MCAR SS 1.90101-1.90906 and the code and bears a manufactured home accessory structure seal and is accompanied by a certificate by the manufacturer or dealer evidencing that it complies with the code.

2 MCAR S 1.90202 Acquisition of labels and seals; installer registration.

101
207

A. Acquisition of labels. United States Department of Housing and Urban Development labels are acquired by the manufacturer from the secretary pursuant to the act and with submission of the fee required in 2 MCAR S 1.90902.

B. Acquisition of construction seals. Any person may qualify for construction seals by furnishing proof on forms furnished by the commissioner that the manufactured home to which the seal is to be affixed was manufactured in compliance with the state manufactured home building code and has not been brought out of conformance because of damage, additions, or alterations.

C. Acquisition of accessory structure seals. Any manufacturer of accessory structures shall qualify for acquisition of a construction seal by:

1. Obtaining plan approval pursuant to 2 MCAR SS 1.90301-1.90310 and requesting an inspection of each manufactured home constructed pursuant to 2 MCAR S 1.90401;

2. Obtaining plan approval pursuant to 2 MCAR SS 1.90301-1.90310 and quality control approval pursuant to 2 MCAR S 1.90501; or

3. Obtaining certification by an independent agency approved by the commissioner pursuant to 2 MCAR S 1.90601.

D. Installer registration. Application for installer registration shall be on the form issued by the commissioner supporting evidence the commissioner deems necessary to establish that installation seals issued to an installer will be affixed only to those manufactured homes where the support system and ground anchoring system installations comply with 2 MCAR SS 1.90101-1.90906 and the code.

E. Acquisition of installation seals. Any registered installer shall qualify for acquisition of an installation seal by applying for registration as an installer to the commissioner on the form issued by the commissioner.

2 MCAR S 1.90204 Application for seals.

A. Application for construction seals. Any person who has met the applicable requirements of 2 MCAR S 1.90202 shall apply for construction seals using the forms issued by the commissioner. The application shall be accompanied by the construction seal fee set forth in 2 MCAR S 1.90902.

B. Application for installation seals. Any registered installer who has met the applicable requirements of 2 MCAR S 1.90202 shall apply for installation seals. The application shall be on forms issued by the commissioner, and the application shall be accompanied by the installation seal fee set forth in 2 MCAR S 1.90902.

C. Application for accessory structure seals. Any manufacturer of manufactured home accessory structures who has met the applicable requirements of 2 MCAR S 1.90202 shall apply for accessory structure seals. The application shall be on the forms issued by the commissioner, and the application shall be accompanied by the accessory structure seal fee set forth in 2 MCAR S 1.90902.

2 MCAR S 1.90205 Denial and repossession of seals.

A. Installation seals. Should investigation or inspection reveal that a registered installer has not installed a manufactured home according to 2 MCAR SS 1.90101-1.90906 and the code, the commissioner may deny the installer's application for new installation seals, and any installation seals previously issued shall be confiscated. Upon satisfactory proof of modification of such installation bringing it into compliance, the installer may resubmit an application for installation seals.

B. Accessory seals. Should investigation or inspection reveal that a manufacturer is not constructing manufactured home accessory structures according to plans approved by the commissioner, and the manufacturer, after having been served with a notice setting forth in what respect the provisions of 2 MCAR SS 1.90101-1.90906 and the code have been violated, continues to manufacture manufactured home accessory structures in violation of these rules and the code, applications for new accessory seals shall be denied, and the accessory seals previously issued shall be confiscated. Upon satisfactory proof of compliance the manufacturer may resubmit an application for accessory seals.

2 MCAR S 1.90206 Seal or label removal.

A. Construction seals or labels. If any manufactured home bearing the construction seal or label or any manufactured home once sold to a consumer is found to be in violation of the code, the commissioner may remove the construction seal or label after furnishing the owner or his agent with a written statement of the violation. The commissioner shall not issue a new construction seal or reissue a label until corrections have been made and the owner or his agent has requested an inspection pursuant to 2 MCAR S 1.90401.

B. Installation seals. Should a violation of the rules and regulations regarding installation be found, the commissioner may remove the installation seal after furnishing the owner or his agent with a written statement of the violation. The commissioner shall not issue a new installation seal until corrections have been made and the owner or his agent has requested an inspection pursuant to 2 MCAR S 1.90401.

C. Accessory structure seals. If any accessory structure bearing the accessory structure seal is found to be in violation of the code, the commissioner may remove the accessory structure seal after furnishing the owner or his agent with a written statement of the violation. The commissioner shall not issue a new accessory structure seal until corrections have been made and the owner or his agent has requested an inspection pursuant to 2 MCAR S 1.90401.

2 MCAR S 1.90207 Placement of seals.

A. Construction seals.

1. Each construction seal shall be assigned and affixed to a specific manufactured home. Assigned construction seals are not transferable and are void when not affixed as assigned, and all voided construction seals shall be returned to, or may be confiscated by, the commissioner. The construction seal shall remain the property of the commissioner and may be reappropriated by the commissioner in the event of violation of the conditions of approval. Multiple unit manufactured homes

shall be assigned and bear consecutively serial numbered construction seals.

2. The construction seal shall be securely affixed to the rear of the manufactured home on the lower left corner of the exterior wall not less than six inches above the floor line.

B. Installation seals. Only one of each type of installation seal shall be assigned to a manufactured home whether the manufactured home consists of one or multiple units. The installation seal shall be placed in a readily visible location adjacent to the primary label or construction seal. Appropriate installation seals shall be affixed to each accessory structure.

C. Accessory structure seals.

1. Each accessory structure seal shall be assigned and affixed to a specific accessory structure. Assigned accessory structure seals are not transferable and are void when not affixed as assigned, and all such accessory structure seals shall be returned to, or may be confiscated by, the commissioner. The accessory structure seal shall remain the property of the commissioner and may be reappropriated by the commissioner in the event of violation of the conditions of approval. Multiple unit accessory structures shall be assigned and bear consecutively serial numbered accessory structure seals.

2. The accessory structure seal shall be securely affixed in a readily visible location.

2 MCAR S 1.90208

A. Lost or damaged seals, construction.

1. When a construction seal is lost or damaged, the commissioner shall be notified in writing by the owner. The owner shall identify the manufacturer, the mobile home serial number, and when possible, the construction seal serial number.

2. All damaged construction seals shall be promptly returned. Damaged and lost construction seals shall be replaced by the commissioner with a new construction seal bearing the date of issue of the original construction seal upon payment of the replacement construction seal fee as provided in 2 MCAR S 1.90902.

B. Lost or damaged seals, installation.

1. When an installation seal is lost or damaged, the commissioner shall be notified in writing. The notice shall identify the construction seal serial number, the mobile home manufacturer, the manufacturers' serial number and the location of the installation, and where available, the date of installation of the mobile home including the installation seal serial number.

2. Damaged or lost installation seals shall be replaced by the commissioner upon payment of the installation seal fee as provided in 2 MCAR S 1.90902.

C. Lost or damaged seals, accessory structure.

1. When an accessory structure accessory seal is lost or damaged, the commissioner shall be notified in writing by the owner. The owner shall identify the manufacturer, the mobile home accessory structure serial number, and when possible, the accessory structure seal serial number.

2. All damaged accessory structure seals shall be promptly returned. Damaged and lost accessory structure seals shall be replaced by the commissioner with a new accessory structure seal bearing the date of issue of the original accessory structure seal upon payment of the replacement accessory structure seal fee as provided in 2 MCAR S 1.90902.

2 MCAR S 1.90209 Return of seals.

A. Installation seals. When an installer discontinues the installation of manufactured homes, he shall notify the commissioner within ten days of the date of such discontinuance and return all unused installation seals which have been issued to him. Installation seals may not be transferred by any installer.

B. Accessory structure seals. When a manufactured home manufacturer of accessory structures discontinues production of a model carrying the commissioner's plan approval, the manufacturer shall, within ten days, advise the commissioner of the date of such discontinuance and either return all seals allocated for such discontinued accessory structure model or assign the seals to other approved accessory structure models.

2 MCAR S 1.90210 Compliance certificate.

A. Installation compliance certificate. The installer shall provide the commissioner with an installation compliance certificate in addition to the certificate required in 2 MCAR S 1.90201. The installation compliance certificate shall be issued by the commissioner.

B. Manufactured home accessory structure compliance certificate. A manufacturer shall provide the commissioner with a manufactured home accessory structure compliance certificate required in 2 MCAR S 1.90201. Manufactured home accessory structure compliance certificate forms shall be issued by the commissioner.

2 MCAR S 1.90301 Plans required. To obtain plan approval a manufacturer shall submit plans for an accessory structure model or model group and for structural, electrical, mechanical, and plumbing systems, where such systems are involved in the construction. The plans shall include installation requirements.

2 MCAR S 1.90302 Application for manufactured home accessory structure approval.

A. Contents; generally. An application for a manufactured home accessory structure approval shall contain the following:

1. Name and address of manufacturer;

2. Location of plant where manufacture will take place;

3. Identification of plans, specifications, or other documents being submitted; and

4. Identification of approved quality control procedures

and manual.

B. Plans and specifications. Submissions of required plans and specifications shall be in duplicate and shall include, but not be limited to, the following:

1. A dimensioned floor plan(s);

2. Proposed use of rooms and method of light and ventilation;

3. Size, type, and location of windows and exterior doors;

4. Type and location of all appliances and fixtures;

5. Type and location of plumbing, drain, water, gas, and electrical connections;

6. Type and location of all electrical outlets (receptacles and lights);

7. Number of outlets and appliances on each circuit and circuit rating; and

8. Installation details and instructions.

2 MCAR S 1.90303 Application for support and anchoring systems approval.

209-303

A. Contents. All support and anchor systems equipment manufacturers shall submit plans, structural details, specifications, installation instructions, and test reports prepared by an independent testing agency, including engineering calculations in such detail as is necessary for evaluation and approval of support and anchoring systems based on 2 MCAR S 1.90450.

B. Approval. Approval of support and anchoring systems is required from all equipment manufacturers.

305-460

2 MCAR S 1.90305 Equipment and systems. The commissioner may approve equipment and installations which are approved by a recognized testing agency. Equipment and installations not approved by a recognized testing agency may be approved by the commissioner when he determines such equipment and installations comply with the code.

305-460

2 MCAR S 1.90307 Non-conforming plans, specifications and supporting data. Should the plans, specifications, and supporting data not conform with these rules and the code, the applicant shall be so notified in writing by the commissioner. Should the applicant fail to submit corrected information in accordance with the commissioner's request, the application will be deemed abandoned and all fees due will be forfeited to the state. Additional submissions shall be processed as new applications.

305-460

2 MCAR S 1.90308 Evidence of commissioner's approval. Approved plans and specifications for accessory structures and support and anchoring systems shall be evidenced by the stamp of approval of the commissioner and the assignment of an approval number to evidence approval. Installation instructions shall be supplied by the manufacturer and shall reference the Minnesota approval number.

305-460

2 MCAR S 1.90309 Support and anchoring systems approval expiration. Approval of support and anchoring systems shall expire when the commissioner adopts revisions to requirements under which approval was granted unless the manufacturer submits evidence to the commissioner establishing that the plans are in compliance with the code as revised.

305-460

2 MCAR S 1.90310 Changes to approved support and anchoring systems. Where the manufacturer proposes changes to approved support and anchoring systems, two sets of supplemental details shall be submitted to the commissioner for review and approval. Approved changes will be reflected in the approval number identification previously assigned by the commissioner.

305-460

2 MCAR S 1.90401 Inspection requests. Any person manufacturing mobile homes or any person selling, offering for sale or parking any mobile home in any mobile home park in the state, or any dealer or installer of mobile homes, may request the commissioner to make an inspection of any mobile home manufactured after July 1, 1972, if said person holds title to the house to be inspected. Additionally, any person holding title to the mobile home may request inspection of the ground support and anchoring system. Inspection requests should be made on "Application for Inspection" forms, available from the commissioner. In connection with requested inspections, the

commissioner may require plans, specifications, calculations and test results.

305-460 2 MCAR S 1.90402 Action after requested inspection. If the manufactured home inspected meets the requirements of the code, if plan approval has been obtained, and if all applicable fees have been remitted, the applicant may apply for a construction seal. If the requested inspection was to determine compliance with respect to support and anchoring requirements and if all applicable fees have been remitted, the applicant may apply for an installation seal.

305-460 2 MCAR S 1.90403 Other inspections. In addition to making inspections on request, the commissioner shall make periodic inspections of the facilities of persons who are subject to the code and 2 MCAR SS 1.90101-1.90906. The inspections shall include oversight inspections at the in-state manufactured home manufacturing facilities to review the manufacturer's consumer complaint handling and notification and correction as required by 2 MCAR SS 1.90702-1.90720. Oversight inspections shall be made annually. The frequency of oversight inspections may be increased when the need is indicated by the number of consumer complaints received by the commissioner.

305-460 2 MCAR S 1.90404 Notice of violations. When an inspection reveals that a mobile home is in violation of the code, or these rules, the commissioner shall serve upon the owner or his agent a notice specifying the violation(s). An owner or agent so served shall not move said mobile home from his premises until such time as the commissioner determines that the mobile home has been brought into compliance with the code, and these rules.

305-460 2 MCAR S 1.90450 Stabilizing systems for manufactured home installation.

A. Stabilizing devices installed at site of occupancy. Stabilizing devices when installed at the site of occupancy shall comply with these rules.

1. Manufacturer's installation instructions. Each manufactured home shall have its stabilizing system installed in accordance with the manufactured home manufacturer's installation instructions. The manufacturer's instructions shall include a typical support system designed by a registered professional engineer or architect to support the anticipated loads that the manufacturer's installation instructions specify for the design zone, including climate, of installation. The instructions shall also meet the requirements of 2 MCAR SS 1.90702-1.90720. These instructions shall be left with the manufactured home following installation.

Footings shall be sized to support the loads shown in these

instructions.

Stabilizing devices not provided with the manufactured home shall meet or exceed the design and capacity requirements of the manufactured home manufacturer and these rules and shall be installed in accordance with the manufactured home manufacturer's installation instructions.

Foundation systems shall be in compliance with the state building code.

No portion of a manufactured home shall be removed during installation or when located on its home site unless it is designed to be removable and is removed in accordance with the manufacturer's instructions.

2. Stabilizing system design. Mobile homes manufactured prior to September 1974 not provided with manufacturer's instructions for stabilizing devices and their installation shall be provided with anchoring and support systems designed by a registered professional engineer or architect or shall comply with the following requirements:

a. Number, spacing, and location of anchoring ties.

(1) Number of ties. The minimum number of ties per side for various lengths of mobile homes shall be in accordance with Table 1.90450 A.2.a.(1).

(2) Spacing of ties. Ties shall be as evenly spaced as practicable along the length of the mobile home with not more than eight feet open-end spacing on each end.

(3) Location of ties. When continuous straps are provided as vertical ties, such ties shall be positioned at rafters and studs. Where a vertical tie and diagonal tie are located at the same place, both ties may be connected to a single ground anchor, provided that the anchor used is capable of carrying both loadings.

(4) Special ties. Clerestory roofs and add-on sections of expandable mobile homes shall have provisions for vertical ties at the exposed ends.

b. Protection of ties and mobile home roofing and siding. Protection shall be provided at sharp corners where the anchoring system requires the use of external cables or straps. Protection shall also be provided to minimize damage to roofing or siding by the cable or strap.

c. Alternate method using strapping. If the alternate method incorporating baling straps specified in Table 1.90450 A.2.a.(1). is used, the baling straps shall be wrapped completely around the mobile home passing under the main steel frame, with both ends of each strap fastened together under tension. The straps shall be in accordance with 2 MCAR S

1.90450 C. The method used to connect the ends of the strap shall not reduce the allowable working load and overload.

B. Foundation and support systems. Each manufactured home shall be installed on a foundation system or shall have a support system as specified herein. A minimum clearance of 12 inches shall be maintained beneath the underside of the main frame (I-beam or channel beam) in the area of utility connections when the manufactured home is not installed on a foundation system.

1. Mobile homes with installation instructions. Individual footings and load-bearing piers or listed supports shall be sized and located to support the loads specified in the manufacturer's installation instructions to assure that the manufacturer's warranty remains valid.

2. Mobile homes for which installation instructions are not available. Unless the entire support system is designed by a registered professional engineer or architect, and approved by the authority having jurisdiction prior to installation, supports shall be spaced not more than ten feet apart for mobile homes 12 feet wide or less, and not more than eight feet apart for mobile homes over 12 feet wide, beginning from the front wall of the mobile home, with not more than two feet open-end spacing at the area of the main frame. Supports shall be installed directly under the main frame (or chassis) of the mobile home. Methods other than those specified herein shall be approved prior to installation by the authority having jurisdiction. Double wide mobile homes built with a conventional frame shall have additional supports placed under the center (mating) line at each end wall, and at the support columns located at the sides of center wall openings eight feet in width or greater. The supports shall be constructed to withstand the weight calculated by multiplying one half the width of the opening (in feet) times one half the width of the home (in feet) multiplied by 35 pounds per square foot. (30 pound snow load and five pound roof load.)

3. Footings. The required load-bearing capacity of individual load-bearing supports and their footings shall be calculated at not less than a combined live and dead load of 65 PSF. Footings shall be adequate in size to withstand the tributary live and dead loads of the mobile home and any concentrated loads.

a. Footings shall be at least 16-inch by 16-inch by 4-inch solid concrete blocks or other product approved for the use intended. As an alternate, two 8-inch by 16-inch by 4-inch solid concrete blocks can be used as footings provided the joint between the blocks is parallel to the steel I-beam frame.

b. Footings or pier foundations, when required, shall be placed level on firm undisturbed soil or on controlled fill which is free of grass and organic materials, compacted to a minimum load-bearing capacity of 2,000 PSF (unless otherwise

approved by a registered professional engineer). Where unusual soil conditions exist as determined by the authority having jurisdiction, footings shall be designed specifically for such conditions.

4. Piers. Piers or load-bearing supports or devices shall be designed and constructed to evenly distribute the loads. Piers shall be securely attached to the frame of the mobile home or shall extend at least six inches from the centerline of the frame member. Load-bearing supports or devices shall be listed and labeled, or shall be designed by a registered professional engineer or architect, and shall be approved for the use intended, prior to installation, or piers shall be constructed as follows:

a. Piers less than 40 inches in height shall be constructed of open or closed cell, 8-inch by 16-inch concrete blocks (with open cells vertically placed upon the footing). Single-stacked block piers shall be installed with the 16 inch dimension perpendicular to the main (I-beam) frame. The piers shall be covered with a two inch by eight inch by sixteen inch wood or concrete cap. (See Figure A-1).

b. Subject to the limitations of 2 MCAR S 1.90450 B.5., piers between 40 to 80 inches in height and all corner piers over three blocks high shall be double blocked with blocks interlocked and capped with a four inch by sixteen inch by sixteen inch solid concrete block, or equivalent. (See Figure A-2.)

c. Subject to the limitations of 2 MCAR S 1.90450 B.5., piers over 80 inches in height shall be constructed as per 2 MCAR S 1.90450 B.4.b., and they shall be laid in concrete mortar and steel reinforcing bars inserted in block cells filled with concrete. (See Figures A-3 and A-4.)

5. Elevated mobile homes. When more than one-fourth of the area of a mobile home is installed so that the bottom of the main frame members are more than three feet above ground level, the mobile home stabilizing system shall be designed by a qualified registered professional engineer or architect and the installation shall be approved prior to installation by the authority having jurisdiction.

6. Plates and shims. A cushion of wood plate not exceeding two inches in thickness and shims not exceeding one inch in thickness may be used to fill any gap between the top of the pier and the main frame. Two inch or four inch solid concrete blocks may be used to fill the remainder of any gap. Shims shall be at least four inches wide and six inches long and shall be fitted and driven tight between the wood plate or pier and main frame.

C. Anchoring equipment. Anchoring equipment, when installed, shall be capable of resisting an allowable working load equal to or exceeding 3,150 pounds and shall be capable of

withstanding a 50 percent overload (4,725 pounds total) without failure of either the anchoring equipment or the attachment point on the mobile home. When the stabilizing system is designed by a qualified registered professional engineer or architect, alternative working load may be used providing the anchoring equipment is capable of withstanding a 50 percent overload.

1. Resistance to weather deterioration. Anchoring equipment exposed to weathering shall have a resistance to weather deterioration at least equivalent to that provided by a coating of zinc on steel of not less than 0.625 ounces per square foot on each side of the surface coated as determined by ASTM Standard Methods of Test for Weight of Coating on Zinc-coated (galvanized) Iron or Steel Articles (ASTM A90-69 (1973). NOTE: Slit or cut edges of zinc-coated steel strapping do not need to be zinc coated.

2. Permanency of connections. Anchoring equipment shall be designed to prevent self-disconnection when ties are slack. Hook ends shall not be used in any part of the anchoring system.

3. Tensioning device design. Tensioning devices such as turnbuckles or yoke-type fasteners shall be ended with clevis or forged or welded eyes.

4. Ties. Cable or strapping or other approved methods or materials shall be used for ties. All ties shall be fastened to ground anchors and drawn tight with turnbuckles or other adjustable tensioning devices or devices listed with the ground anchor.

a. Tie materials shall be capable of resisting an allowable working load of 3,150 pounds with no more than two percent elongation and shall withstand a 50 percent overload (4,725 pounds total). Ties shall comply with the weathering requirements of 2 MCAR S 1.90450 C.1. NOTE: Type 1, Class B, Grade 1 steel strapping, 1 1/4 inches wide and 0.035 inch thick, conforming with Federal Specification QQ-S-781G, is capable of meeting the working load and 50 percent overload specified herein.

b. Ties shall connect the ground anchor and the main structural steel frame (I-beam or other shape) which runs lengthwise under the mobile home. Ties shall not connect to steel outrigger beams which fasten to and intersect the main structural frame unless specifically stated in the manufacturer's installation instructions.

c. Connection of the cable frame tie to the mobile home I-beam or equivalent main structural frame member shall be by a 5/8-inch drop forged closed eye bolt through a hole drilled in the center of the I-beam web or other approved methods. The web shall be reinforced if necessary to maintain the I-beam strength.

d. Cable ends shall be secured with at least three U-bolt type cable clamps with the U portion of the clamp installed on the short (dead) end of the cable to assure strength at least equal to that required by 2 MCAR S 1.90450 C.4.a.

D. Ground anchors. Ground anchors, including means for attaching ties, shall be located to effectively match the anchoring system instructions provided by the manufactured home manufacturer, or, if there are no instructions, in accordance with the requirements of A., and shall be designed and installed to transfer the anchoring loads to the ground.

1. Capacity of anchors. Each ground anchor, when installed, shall be capable of resisting an allowable working load at least equal to 3,150 pounds in the direction of the tie plus a 50 percent overload (4,725 pounds total) without failure. Failure shall be considered to have occurred when the point of connection between the tie and anchor moves more than two inches at 4,725 pounds in the direction of the vertical tie when the anchoring equipment is installed in accordance with the manufacturer's instructions. Those ground anchors which are designed to be installed so that the loads on the anchor are other than direct withdrawal shall be designed and installed to resist an applied design load of 3,150 pounds at 45 degrees from horizontal without displacing the anchor more than four inches horizontally at the point where the tie attaches to the anchor. Anchors designed for connection of multiple ties shall be capable of resisting the combined working load and overload consistent with the intent expressed herein.

2. Anchor design and installation. Each manufactured ground anchor shall be approved pursuant to 2 MCAR S 1.90303 and installed in accordance with the anchor manufacturer's instructions and shall include means of attachment of ties meeting the requirements of C.4. Ground anchor manufacturer's installation instructions shall include the amount of preload required, the methods of adjustment after installation, and the load capacity in various types of soils. These instructions shall include tensioning adjustments which may be needed to prevent damage to the manufactured home, particularly damage that can be caused by frost heave.

a. Each ground anchor shall have the manufacturer's identification and listed model identification number marked thereon so that the number is visible after installation. Instructions shall accompany each listed ground anchor specifying the types of soil for which the anchor is suitable under the requirements of 2 MCAR S 1.90450 D.1. NOTE: The following data gives information relative to soil types with blow counts and torque values:

Types of Soils	Blow Count (ASTM D1586)	Test Probe[1] Torque Value[2]
Sound hard rock	NA	NA

Very-dense and/or cemented sands, course gravel and cobbles, preloaded silts, clays, and corals	40-up	more than 550 lbs. inch
Medium-dense coarse sands, sandy gravels, very-stiff silts and clays	24-39	350-549 lbs. inch
Loose to medium dense sands, firm to stiff clays and silts, aluvian fill . . .	14-23[3]	200-349 lbs. inch

[1]The test probe is a device for measuring the torque value of soils to assist in evaluating the holding capability of the soils in which the anchor is placed. The test probe has a helix on it. The overall length of the helical section is 10.75 inches; the major diameter is 1.25 inches; the minor diameter is 0.81 inches; the pitch is 1.75 inches. The shaft must be of suitable length for anchor depth.

[2]A measure synonymous with moment of a force when distributed around the shaft of the test probe.

[3]Below these values, a professional engineer should be consulted.

3. Use of concrete slabs or continuous footings. If concrete slabs or continuous footings are used to transfer the anchoring loads to the ground, the following shall be required:

a. Steel rods cast in concrete shall be capable of resisting loads as specified in 2 MCAR S 1.90450 D.1.

b. Deadman concrete anchors may be used in place of listed anchors if they meet the requirements of 2 MCAR S 1.90450 D.1.

c. Concrete slabs may be used in place of ground anchors provided the slab is so constructed that it provides holding strength equal to the requirements of 2 MCAR S 1.90450 D.1.

4. Other anchoring devices. Other anchoring devices meeting the requirements of this section shall be permitted if approved prior to installation by the authority having jurisdiction.

E. Anchor installation.

1. Specifications for anchors. Each type anchor suitable for this purpose shall have specification data showing the soil classification(s) for which it qualifies.

2. Selection of anchors. Anchor selection shall be based on a determination of the soil class at the depth the anchor helical plate will be installed.

3. Depth of anchors. All anchors shall be installed to the full depth shown in the anchor manufacturer's installation instructions.

F. Design loads. The following minimum design live loads shall be applicable in all areas of the state of Minnesota.

1. Horizontal 15 lbs/ft^2

2. Vertical/upward 9 lbs/ft^2

3. Vertical/downward 30 lbs/ft^2

Table 1.90450 A.2.a.(1).

Number of Ties Required Per Side of Single Wide[1] Mobile Homes[2]

This table is based on a minimum working load per anchor of 3,150 pounds with a 50 percent overload (4,725 pounds total).

1	2	3	4 Alternate Method[4]	5
Length of[3] Mobile Home (Feet)	No. of Vertical Ties	No. of Diagonal Ties[5]	No. of Baling Straps	No. of Diagonal Ties[6]
up to 40	2	3	2	3
40-46	2	3	2	3
46-49	2	3	2	3
49-54	2	3	2	3
54-58	2	4	2	4
58-64	2	4	2	4
64-70	2	4	2	5
70-73	2	4	2	5
73-84	2	5	2	5

[1]Double-wide mobile homes require only the diagonal ties specified in column 3, and these shall be placed along the outer side walls.

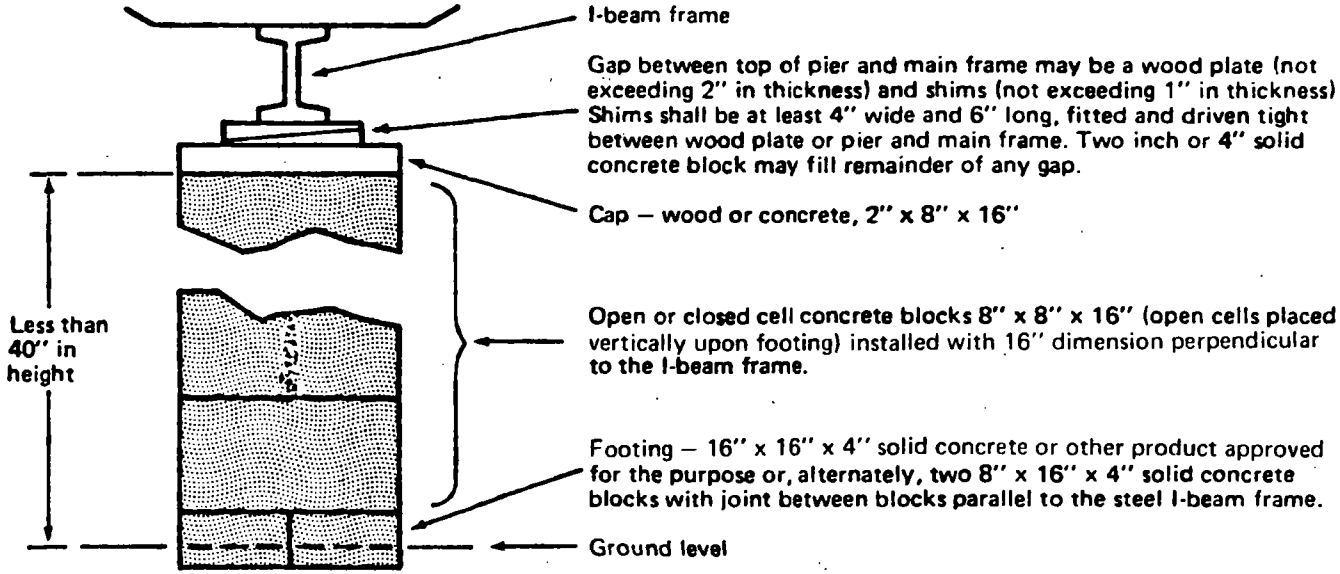
[2]Except when the anchoring system is designed and approved by a registered professional engineer or architect.

[3]Length of mobile home (as used in this Table) means length excluding draw bar.

[4]Alternate Method. When this method is used, an approved reinforcement means shall be provided. If baling is used to accomplish this reinforcement, the provisions of 2 MCAR § 1.90450 A.2.c. shall apply.

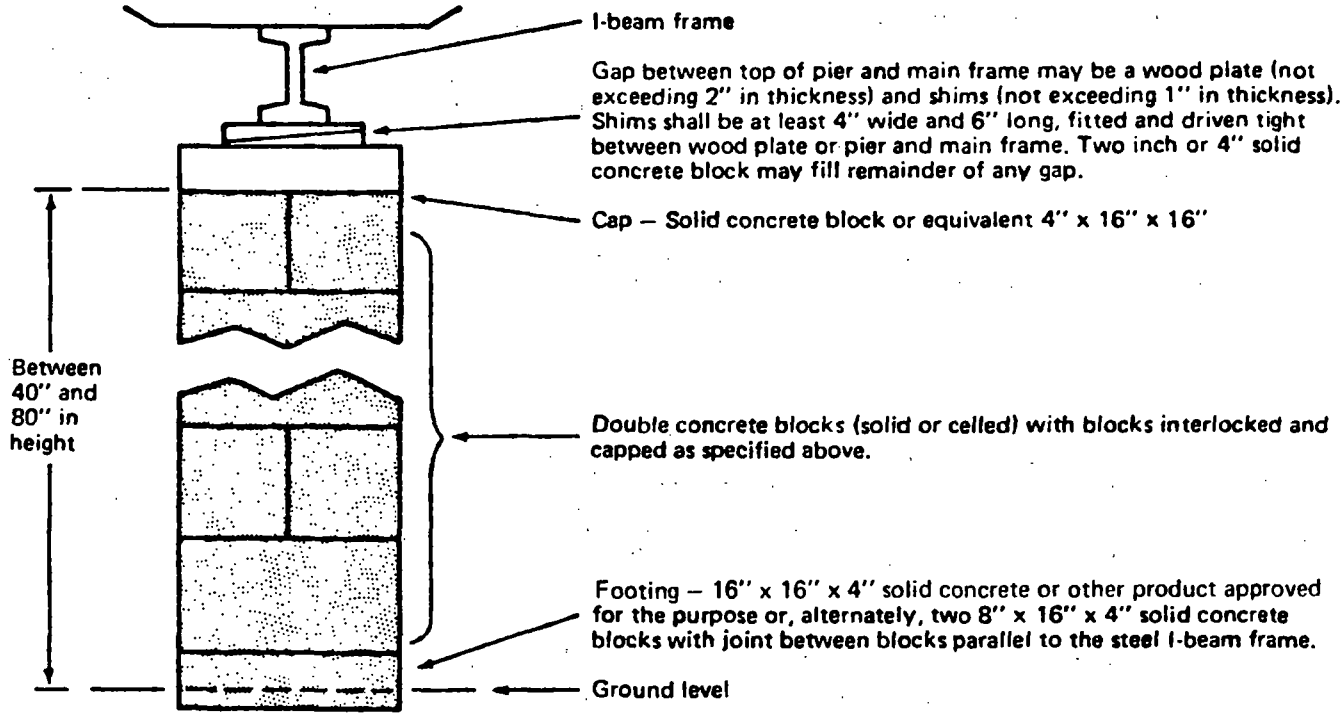
[5]Diagonal ties in this method shall deviate at least 40° from vertical.

[6]Diagonal ties in this method shall be 45° + 5° from vertical and shall be attached to the nearest main frame member.



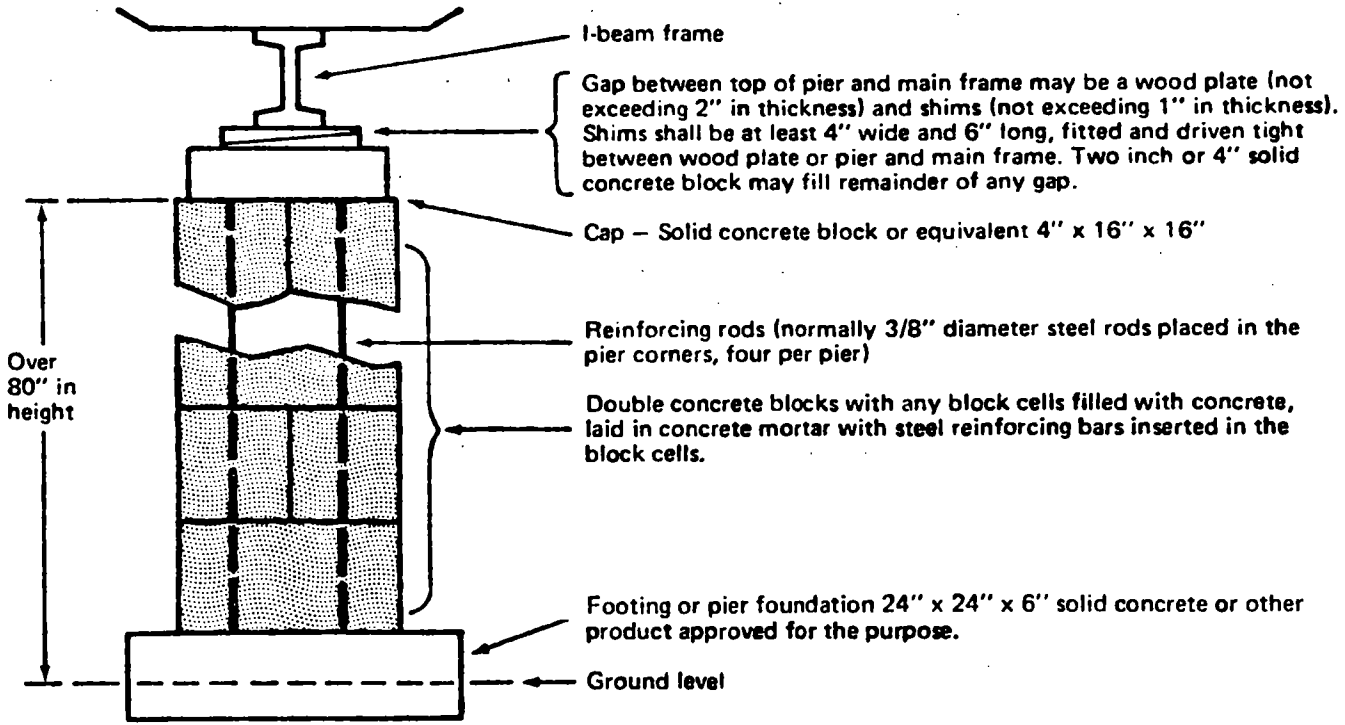
Footing placed on firm undisturbed soil or on controlled fill free of grass and organic materials compacted to a minimum load-bearing capacity of 2000 PSF.

Figure A-1. For piers less than 40 inches in height (except corner piers over 3 blocks high). Piers shall be securely attached to the frame of the mobile home or shall extend at least 6 inches from the centerline of the frame member.



Footing placed on firm undisturbed soil or on controlled fill free of grass and organic materials compacted to a minimum load-bearing capacity of 2000 PSF.

Figure A–2. For piers 40 inches to 80 inches in height and all corner piers over 3 blocks high. Piers shall be securely attached to the frame of the mobile home or shall extend at least 6 inches from the centerline of the frame member.



Footing placed on firm undisturbed soil or on controlled fill free of grass and organic materials compacted to a minimum load-bearing capacity of 2000 PSF.

Figure A–3. For piers exceeding 80 inches in height. Piers shall be securely attached to the frame of the mobile home or shall extend at least 6 inches from the centerline of the frame member.

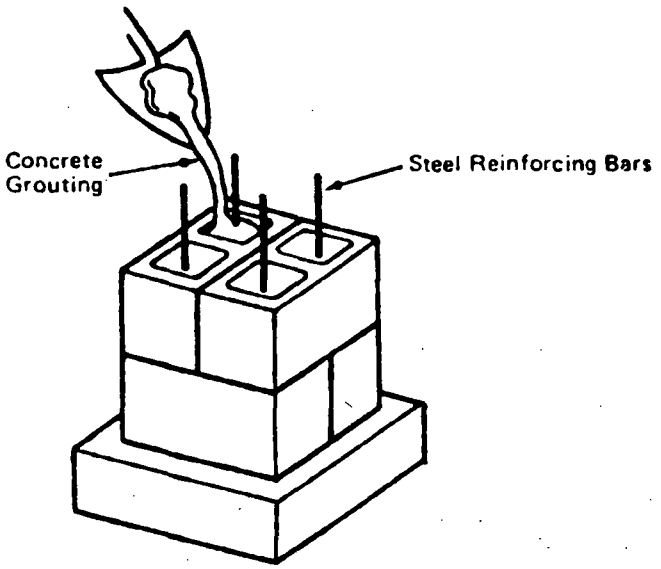


Figure A-4. For piers exceeding 80 inches in height the concrete blocks must be filled with concrete grouting and steel reinforcing rods utilized.

305-460

2 MCAR S 1.90460 Utility connections.

A. Water connections. Water piping to manufactured homes shall be in compliance with the 1979 Minnesota Plumbing Code, rules MHD 120-135 of the Department of Health. Pipes shall be protected from freezing. A heat tape, when installed, shall be listed and installed in conformance with its listing and the manufacturer's instructions. When the manufactured home is installed on a support system subject to ground movement due to freezing and thawing, approved flexible connectors or semirigid copper tubing shall be used to prevent pipe breakage.

B. Sewer connections. Waste piping to manufactured homes shall be in compliance with the 1979 Minnesota Plumbing Code, rules MHD 120-135 of the Department of Health. When a manufactured home is installed on a support system subject to ground movement due to freezing and thawing, offsets or approved flexible connectors, or both, shall be used to prevent pipe breakage.

C. Gas piping. Gas piping to the manufactured home shall be of adequate capacity rating to supply the connected load. It shall be installed in compliance with the Minnesota Heating, Ventilating, Air Conditioning, and Refrigeration Code, rules SBC 7101-8505 of the Department of Administration. When the manufactured home is installed on a support system subject to ground movement because of freezing and thawing, semi-rigid copper pipe or a listed manufactured home gas connector for exterior use only shall be installed to prevent pipe breakage. Gas piping shall be protected from physical damage.

1. The manufactured home fuel gas piping system shall be tested before it is connected to the gas supply. Only air shall be used for the test. The manufactured home gas piping system shall be subjected to a pressure test with all appliance shutoff valves, except those ahead of fuel gas cooking appliances, in the open position. Appliance shutoff valves ahead of fuel gas cooking appliances shall be closed.

2. The test shall consist of air pressure at not less than ten inches nor more than 14 inches water column (six ounces to eight ounces per square inch). The system shall be isolated from the air pressure source and maintain this pressure for not less than ten minutes without perceptible leakage. Upon satisfactory completion of the test, the appliance valves ahead of fuel gas cooking appliances shall be opened, and the gas cooking appliance connectors tested with soapy water or bubble solution while under the pressure remaining in the piping system. Solutions used for testing for leakage shall not contain corrosive chemicals. Pressure shall be measured with either a manometer, slope gage, or gage calibrated in either water inches or pounds per square inch with increments of either one-tenth inch or one-tenth pounds per square inch, as applicable. Upon satisfactory completion of the test, the manufactured home gas supply connector shall be installed and

the connections tested with soapy water or bubble solution.

D. Electrical connections. On-site electrical connections to the manufactured home and any on-site electrical wiring required to prepare the manufactured home for occupancy shall be done in conformance with the manufactured home building code and shall be installed and inspected as required by the Minnesota Electrical Act, Minnesota Statutes, sections 326.241 to 326.248.

305 460

2 MCAR S 1.90501 Procedure. To obtain quality control approval for a manufacturing facility, a manufacturer shall submit a quality control manual pursuant to 2 MCAR Section 1.90501 A.1. and consent to investigations and inspections at reasonable hours by the commissioner for field verification of satisfactory quality control.

A. Applications for approval of quality control manuals shall contain the following:

1. An application in letter form to be accompanied by two copies of the quality control manual containing those items required by 2 MCAR Section 1.90501 A.2.

2. An outline of the procedure which will direct the manufacturer to construct mobile homes in accordance with the approved plans specifying:

a. Scope and purpose

b. Receiving inspection procedure for basic materials

c. Material storage and stock rotation procedures

d. Types and frequency of product inspection

e. Sample of inspection control form used

f. Major pieces of production equipment

g. Assignments, experience and qualifications of quality control personnel

h. Test equipment

i. Control of drawings and material specifications

j. Test procedures

k. Record keeping procedures.

B. Where the manufacturer proposes changes to the quality control manual, two copies of such changes shall be submitted to the commissioner for approval.

305
460

2 MCAR S 1.90601 Qualifications for approval. The certification and registration of an agency shall not be issued until said agency has received the commissioner's approval. To obtain approval and become registered, an agency shall submit to the commissioner an application on the form issued by the commissioner to include the following stating that said agency is:

A. Not under the jurisdiction or control of any manufacturer or supplier of an industry.

B. Professionally competent to determine that a mobile home is in compliance with the code by:

1. Inspecting mobile homes

2. Reviewing plans and specifications

3. Evaluating quality control procedures.

C. To report findings regarding code compliance in detailed reports to the commissioner as requested.

D. Submit registration fees as required in 2 MCAR S 1.90904.

2 MCAR S 1.90602 Upon certification by an approved registered independent agency pursuant to these rules and the code, a manufacturer may apply for seals under 2 MCAR S 1.90204.

2 MCAR S 1.90701 Construction alterations.

A. Effect on seal. Any alteration of the construction, plumbing, heating, cooling, or fuel burning system, electrical equipment or installations or fire safety in a manufactured home which bears a seal shall void such approval, and the seal shall be returned to the commissioner.

B. Acts not constituting alterations. The following shall not constitute an alteration:

1. Repairs with approved components or parts;

2. Conversion of listed fuel-burning appliances in accordance with the terms of their listing;

3. Adjustment and maintenance of equipment; or

4. Replacement of equipment in kind.

C. Application. Any person proposing an alteration to a manufactured home bearing a seal or label shall make application to the commissioner on the form issued by the commissicner.

D. Inspection. Upon completion of the alteration, the applicant shall request the commissioner to make an inspection pursuant to 2 MCAR S 1.90401.

E. Replacement construction seal. The applicant may apply for a replacement construction seal upon inspection and approval of the alteration.

F. Replacement accessory structure seal. The applicant may apply for a replacement accessory structure seal upon inspection and approval of the alteration.

2 MCAR S 1.90702 Consumer complaint handling and remedial actions. Rules 2 MCAR SS 1.90702-1.90720 govern consumer complaint handling and remedial actions.

2 MCAR S 1.90703 Purpose. The purpose of 2 MCAR SS 1.90702-1.90720 is to establish a system under which the protections of the act are provided with a minimum of formality and delay, but in which the rights of all parties are protected.

2 MCAR S 1.90704 Scope. Rules 2 MCAR SS 1.90702-1.90720 set out the procedures to be followed by manufacturers, production

inspection primary inspection agencies, and the commissioner to assure that manufacturers provide notification and correction with respect to their manufactured homes as required by the act. Rules 2 MCAR SS 1.90702-1.90720 set out the rights of dealers under United States Code, title 42, section 5412 (1976), as amended through March 15, 1982 to obtain remedies from manufacturers in certain circumstances.

2 MCAR S 1.90705 Consumer complaints. Under 2 MCAR SS 1.90702-1.90720, all consumer complaints or other information indicating the possible existence of an imminent safety hazard, serious defect, defect, or noncompliance shall be referred to the manufacturer of the potentially affected manufactured homes in a timely manner so that the manufacturer can quickly respond to the consumer and take any necessary remedial actions.

2 MCAR S 1.90706 Notification and correction requirement.

A. Requirement. Notification and correction shall be required to be provided with respect to manufactured homes that have been sold or otherwise released by the manufacturer to another party when the manufacturer, a state administrative agency, the commissioner, or the secretary determines that an imminent safety hazard, serious defect, defect, or noncompliance may exist in those manufactured homes.

B. Extent of manufacturer's responsibility. The extent of a manufacturer's responsibility for providing notification or correction shall be governed by the seriousness of problems for which the manufacturer is responsible under 2 MCAR SS 1.90702-1.90720.

C. Limitation of manufacturer's liability to provide remedial action. The liability of manufactured home manufacturers to provide remedial actions under 2 MCAR SS 1.90702-1.90720 is limited by the principle that manufacturers are not responsible for failures that occur in manufactured homes or components solely as the result of normal wear and aging, gross and unforeseeable consumer abuse, or unforeseeable neglect of maintenance.

2 MCAR S 1.90707 Consumer complaint and information referral. When a consumer complaint or other information indicating the possible existence of a noncompliance, defect, serious defect, or imminent safety hazard is received by the commissioner, the commissioner shall forward the complaint or other information to the manufacturer of the manufactured home in question. The commissioner shall, when it appears from the complaint or other information that more than one manufactured home may be involved, simultaneously send a copy of the complaint or other information to the state administrative agency of the state where the manufactured home was manufactured or to the secretary if there is no such state administrative agency, and when it

appears that an imminent safety hazard or serious defect may be involved, simultaneously send a copy to the secretary.

2 MCAR S 1.90708 Notification pursuant to manufacturer's determination.

A. Notice requirement. The manufacturer shall provide notification as set out in 2 MCAR SS 1.90702-1.90720 with respect to all manufactured homes produced by the manufacturer in which there exists or may exist an imminent safety hazard or serious defect. The manufacturer shall provide such notification with respect to manufactured homes produced by the manufacturer in which a defect exists or may exist if the manufacturer has information indicating that the defect may exist in a class of manufactured homes that is identifiable because the cause of the defect or defects actually known to the manufacturer is such that the same defect would probably have been systematically introduced into more than one manufactured home during the course of production. This information may include, but is not limited to, complaints that can be traced to the same cause, defects known to exist in supplies of components or parts, information related to the performance of a particular employee, and information indicating a failure to follow quality control procedures with respect to a particular aspect of the manufactured home. A manufacturer is required to provide notification with respect to a noncompliance only after the issuance of a final determination under 2 MCAR S 1.90711.

B. Investigations and inspections. Whenever the manufacturer receives from any source information that may indicate the existence of a problem in a manufactured home for which the manufacturer is responsible for providing notification under A., the manufacturer shall, as soon as possible, but not later than 20 days after receiving the information, carry out any necesary investigations and inspections to determine and shall determine whether the manufacturer is responsible for providing notification under A. The manufacturer shall maintain complete records of all such information and determinations in a form that will allow the commissioner to discern readily who made the determination with respect to a particular piece of information, what the determination was, and the basis for the determination. The records shall be kept for a minimum of five years from the date the manufacturer received the information. Consumer complaints or other information indicating the possible existence of noncompliances or defects received before the effective date of 2 MCAR SS 1.90702-1.90720 shall, for purposes of this paragraph, be deemed to have been received on the date 2 MCAR SS 1.90702-1.90720 became effective.

C. Preparation of plan. If a manufacturer determines under B. that the manufacturer is responsible for providing notification under A., the manufacturer shall prepare a plan for notification as set out in 2 MCAR S 1.90713. Where the manufacturer is required to correct under 2 MCAR S 1.90710, the manufacturer shall include in the plan provision for correction

of affected manufactured homes.

D. Submission of plan. The manufacturer shall, as soon as possible, but not later than 20 days after making the determination, submit the plan to the commissioner.

However, where only one manufactured home is involved, the manufacturer need not submit the plan if the manufacturer corrects the manufactured home within the 20-day period. The manufacturer shall maintain, in the plant where the manufactured home was manufactured, a complete record of the correction. The record shall describe briefly the facts of the case and state what corrective actions were taken. It shall be maintained in a separate file in a form that will allow the commissioner to review all such corrections.

E. Action after approval of plan. Upon approval of the plan with any necessary changes, the manufacturer shall carry out the approved plan within the time limits stated in it.

F. Action before plan approval. The manufacturer may act before obtaining approval of the plan. However, such action is subject to review and disapproval by the commissioner except to the extent that agreement to the correction is obtained as described in this paragraph. To be assured that the corrective action will be accepted, the manufacturer may obtain the agreement of the commissioner that the corrective action is adequate before the correction is made regardless of whether a plan has been submitted under D. If such an agreement is obtained, the correction shall be accepted as adequate by the commissioner if the correction is made as agreed to and any imminent safety hazard or serious defect is eliminated.

G. Waiver of formal plan approval and notification. If the manufacturer wishes to obtain a waiver of the formal plan approval and notification requirements that would result from a determination under B., the manufacturer may act under this paragraph. The plan approval and notification requirements shall be waived by the commissioner who would otherwise review the plan under D. if:

1. The manufacturer, before the expiration of the time period determined under D., shows to the satisfaction of the commissioner through documentation that:

a. The manufacturer has identified the class of possibly affected manufactured homes in accordance with 2 MCAR S 1.90713;

b. The manufacturer will correct, at the manufacturer's expense, all affected manufactured homes in the class within 60 days of being informed that the request for waiver has been accepted; and

c. The proposed repairs are adequate to remove the failure to conform or imminent safety hazard that gave rise to

the determination under B.; and

2. The manufacturer corrects all affected manufactured homes within 60 days of being informed that the request for waiver has been accepted.

The formal plan and notification requirements are waived pending final resolution of a waiver request under G. as of the date of the request. If a waiver request is not accepted, the plan called for by C. and D. shall be submitted within five days after the manufacturer is notified that the request was not accepted.

H. Classification of problem. When a manufacturer acts under A.-G., the manufacturer will not be required to classify the problem that triggered the action as a noncompliance, defect, serious defect, or imminent safety hazard.

2 MCAR S 1.90709 Responsibilities of commissioner.

A. Consumer complaints. The commissioner shall oversee the handling of consumer complaints by manufacturers within this state. As part of that responsibility, the commissioner shall monitor manufacturer compliance with 2 MCAR SS 1.90702-1.90720, and particularly with 2 MCAR S 1.90708. This monitoring will be done primarily by periodically checking the records that manufacturers are required to keep under 2 MCAR S 1.90708 B.

B. Preliminary determination. If the commissioner finds under A. that a manufacturer has failed to comply with 2 MCAR S 1.90708 or if the commissioner finds that the manufacturer has decided not to act under 2 MCAR S 1.90708 C. and D. and the commissioner believes the manufacturer is required to act, or if the manufacturer failed to fulfill the requirements of 2 MCAR S 1.90708 G. after requesting a waiver, the commissioner shall make the preliminary determination he deems appropriate under 2 MCAR S 1.90711. However, if the affected manufactured homes were manufactured in more than one state or if it appears that the appropriate preliminary determination would be an imminent safety hazard or serious defect, the commissioner shall refer the matter to the secretary.

C. Preliminary determinations under 2 MCAR S 1.90711. Where the commissioner who is reviewing a plan under 2 MCAR S 1.90708 D. finds that the manufacturer is not acting reasonably in refusing to accept changes to a proposed plan, the commissioner shall make such preliminary determinations as may be appropriate under 2 MCAR S 1.90711. However, if it appears that it would be appropriate to make a preliminary determination of imminent safety hazard or serious defect, the commissioner shall refer the matter to the secretary.

2 MCAR S 1.90710 Required manufacturer correction. A manufacturer required to furnish notification under 2 MCAR S

1.90708 or 2 MCAR S 1.90711 shall correct, at its expense, any imminent safety hazard or serious defect that can be related to an error in design or assembly for the manufactured home by the manufacturer, including an error in design or assembly of any component or system incorporated in the manufactured home by the manufacturer.

2 MCAR S 1.90711 Notification and correction pursuant to administrative determination.

A. Preliminary determinations. Whenever the commissioner has information indicating the possible existence of an imminent safety hazard or serious defect in a manufactured home, the commissioner may issue a preliminary determination to that effect to the manufacturer.

Whenever the information indicates that the manufacturer is required to correct the imminent safety hazard or serious defect under 2 MCAR S 1.90710, the commissioner shall issue a preliminary determination to that effect to the manufacturer. Whenever the commissioner has information indicating that a defect or noncompliance may exist in a class of manufactured homes that is identifiable because the cause of the defect or noncompliance is such that the same defect or noncompliance would probably have been systematically introduced into more than one manufactured home during production, and whenever all manufactured homes in the class appear to have been manufactured in this state, the commissioner may issue a preliminary determination of defect or noncompliance to the manufacturer. Information on which the commissioner will base a conclusion that an affected class of manufactured homes exists consists of complaints that can be traced to the same cause, defects known to exist in supplies of components or parts, information related to the performance of a particular employee, and information indicating a failure to follow quality control procedures with respect to a particular aspect of the manufactured home. If, during the course of these proceedings, evidence arises that indicates that manufactured homes in the same identifiable class were manufactured in more than one state, the commissioner shall refer the matter to the secretary.

B. Notice and request for hearing or presentation of views. Notice of the preliminary determination under A. shall be sent by certified mail. It shall include the factual basis for the determination and the identifying criteria of the manufactured homes known to be affected and those believed to be in the class of possibly affected manufactured homes. The notice shall inform the manufacturer that the preliminary determination shall become final unless the manufacturer requests a hearing or presentation of views under 2 MCAR S 1.90803 within 15 days after receiving a notice of preliminary determination of serious defect, defect, or noncompliance, or within five days of receipt of a notice of preliminary determination of imminent safety hazard.

Promptly upon receipt of a manufacturer's request for a hearing or presentation of views meeting, the hearing or presentation shall be held pursuant to 2 MCAR S 1.90803. Parties may propose in writing, at any time, offers of settlement which shall be submitted to and considered by the commissioner. If determined to be appropriate, the party making the offer may be given an opportunity to make an oral presentation in support of the offer. If an offer of settlement is rejected, the party making the offer shall be so notified, and the offer shall be deemed withdrawn and shall not constitute a part of the record in the proceeding. Final acceptance by the commissioner of any offer of settlement shall automatically terminate any proceedings related to it.

C. Final determinations. If the manufacturer fails to respond to the notice of preliminary determination within the time period established in B., or if the commissioner decides that the views and evidence presented by the manufacturer or others are insufficient to rebut the preliminary determination, the commissioner shall make a final determination that an imminent safety hazard, serious defect, defect, or noncompliance exists. If there is a final determination that an imminent safety hazard, serious defect, defect, or noncompliance exists, the commissioner shall issue an order directing the manufacturer to furnish notification.

D. Appeals. When the commissioner has made a final determination that a defect or noncompliance exists, the manufacturer may appeal to the secretary within ten days after receiving the notice of final determination.

E. Waiver of formal notification requirements. Where a preliminary determination of defect or noncompliance has been issued, the manufacturer may request a waiver of the formal notification requirements at any time during the proceedings called for in A.-D. or after the issuance of a final determination and order. The manufacturer may request a waiver from the commissioner. When requesting a waiver, the manufacturer shall certify and provide assurances that:

1. The manufacturer has identified the class of possibly affected manufactured homes in accordance with 2 MCAR S 1.90713;

2. The manufacturer will correct, at the manufacturer's expense, all affected manufactured homes in the class within a time period specified by the commissioner but not later than 60 days after being informed of the acceptance of the request for waiver or issuance of the final determination, whichever is later; and

3. The proposed repairs are adequate to remove the failure to conform or imminent safety hazard that gave rise to the issuance of the preliminary determination.

The commissioner shall grant the request or waiver if the manufacturer agrees to an offer of settlement that includes an

order that embodies the assurances made by the manufacturer.

2 MCAR S 1.90712 Reimbursement for prior correction by owner. A manufacturer that is required to correct under 2 MCAR S 1.90710 or who decides to correct and obtain a waiver under 2 MCAR S 1.90708 G. or 2 MCAR S 1.90711 E. shall provide reimbursement for reasonable cost of correction to any owner of an affected manufactured home who chooses to make the correction before the manufacturer does.

2 MCAR S 1.90713 Manufacturer's plan for notification and correction.

A. Basic requirement. Paragraphs A.-F. set out the requirements that manufacturers shall meet in preparing plans they are required to submit under 2 MCAR S 1.90708 C. and D. The underlying requirement is that a plan show how the manufacturer will fulfill its responsibilities with respect to notification and correction.

B. Copy of proposed notice. The plan shall include a copy of the proposed notice that meets the requirements of 2 MCAR S 1.90714.

C. Affected class. The plan shall identify, by serial number and other appropriate identifying criteria, all manufactured homes with respect to which notification is to be provided. The class of manufactured homes with respect to which notification shall be provided and which shall be covered by the plan is that class of manufactured homes that was or is suspected of having been affected by the cause of an imminent safety hazard or failure to conform. The class is identifiable to the extent that the cause of the imminent safety hazard or failure to conform is such that it would probably have been systematically introduced into the manufactured homes in the class during the course of production. In determining the extent of such a class, the manufacturer may rely either upon information that positively identifies the extent of the class or upon information that indicates what manufactured homes were not affected by the same cause, thereby identifying the class by excluding those manufactured homes. Methods that may be used in determining the extent of the class of manufactured homes include, but are not limited to:

1. Inspection of manufactured homes produced before and after the manufactured homes known to be affected;

2. Inspection of manufacturer quality control records to determine whether quality control procedures were followed;

3. Inspection of production inspection primary inspection agency records to determine whether the imminent safety hazard or failure to conform was either detected or specifically found not to exist in some manufactured homes;

4. Inspection of the design of the manufactured home in question to determine whether the imminent safety hazard or failure to conform resulted from the design itself;

5. Identification of the cause as relating to a particular employee or process that was employed for a known period of time or in producing the manufactured homes manufactured during that time; and

6. Inspection of records relating to components supplied by other parties and known to contain or suspected of containing imminent safety hazards or failures to conform.

The class of manufactured homes identified by these methods may include only manufactured homes actually affected by the imminent safety hazard or failure to conform if the manufacturer can identify the precise manufactured homes. If it is not possible to identify the precise manufactured homes, the class shall include manufactured homes suspected of containing the imminent safety hazard or failure to conform because the evidence shows that they may have been affected.

D. Production inspection primary inspection agency statement. The plan shall include a statement by the production inspection primary inspection agency operating in each plant in which manufactured homes in question were produced. In this statement, the production inspection primary inspection agency shall concur in the methods used by the manufacturer to determine the class of potentially affected manufactured homes or state why it believes the methods to have been inappropriate, inadequate, or incorrect.

E. Deadline. The plan shall include a deadline for completion of all notification and corrections.

F. Notification. The plan shall provide for notification by certified mail or other more expeditious means to the dealers or distributors of a manufacturer to whom the manufactured homes were delivered. Where a serious defect or imminent safety hazard is involved, notification shall be sent by certified mail if it is mailed. The plan shall provide for notification by certified mail to the first purchaser of each manufactured home in the class of manufactured homes set out in the plan under C. and to any subsequent owner who has any warranty provided by the manufacturer or required by federal, state, or local law on the manufactured home that has been transferred, to the extent feasible. However, notification need not be sent to any person known by the manufacturer not to own the manufactured home in question if the manufacturer has a record of a subsequent owner of the manufactured home. The plan shall provide for notification by certified mail to any other person who is a registered owner of each manufactured home containing the imminent safety hazard, serious defect, defect, or noncompliance and whose name has been ascertained pursuant to the manufacturer's records.

2 MCAR S 1.90714 Contents of notice. Except as otherwise agreed by the commissioner who will review the plan under 2 MCAR S 1.90708 D., the notification to be sent by the manufacturer shall include the following:

A. An opening statement: "This notice is sent to you in accordance with the requirements of the National Manufactured Housing Construction and Safety Standards Act of 1974";

B. Except where the manufacturer is acting under 2 MCAR S 1.90708 the following statement, as appropriate: "(manufacturer's name, or the commissioner or the secretary)" has determined that:

1. An imminent safety hazard may exist in (identifying criteria of manufactured home);

2. A serious defect may exist in (identifying criteria of manufactured home);

3. A defect may exist in (identifying criteria of manufactured home); or

4. (Identifying criteria of manufactured home) may not comply with an applicable federal mobile home construction or safety standard;

C. A clear description of the imminent safety hazard, serious defect, defect, or noncompliance which shall include:

1. The location of the imminent safety hazard, serious defect, defect, or noncompliance in the manufactured home;

2. A description of any hazards, malfunctions, deterioration, or other consequences which may result from the imminent safety hazard, serious defect, defect, or noncompliance;

3. A statement of the conditions which may cause such consequences to arise; and

4. Precautions, if any, that the owner should take to reduce the chance that the consequences will arise before the manufactured home is repaired;

D. An evaluation of the risk to manufactured home occupants' safety and the durability of the manufactured home reasonably related to such imminent safety hazard, serious defect, defect, or noncompliance, including:

1. The type of injury which may occur to occupants of the manufactured home; and

2. Whether there will be any warning that a dangerous occurrence may take place and what that warning would be, and any signs which the owner might see, hear, smell, or feel which

might indicate danger or deterioration of the manufactured home as a result of the imminent safety hazard, serious defect, defect, or noncompliance.

E. If the manufacturer will correct the manufactured home, a statement that the manufacturer will correct the manufactured home;

F. A statement in accordance with whichever of the following is appropriate:

1. Where the manufacturer will correct the manufactured home at no cost to the owner, the statement shall indicate how and when the correction will be done, how long the correction will take, and any other information that may be helpful to the owner; or

2. When the manufacturer does not bear the cost of repair, the notification shall include a detailed description of all parts and materials needed to make the correction, a description of all steps to be followed in making the corrections, including appropriate illustrations and an estimate of the cost to the purchaser or owner of the correction;

G. A statement informing the owner that the owner may submit a complaint to the commissioner if the owner believes that the notification or the remedy described in it is inadequate or the manufacturer has failed or is unable to remedy within a reasonable time after the owner's first attempt to obtain a remedy; and

H. A statement that any actions taken by the manufacturer under the act in no way limit the rights of the owner or any other person under any contract or other applicable law and that the owner may have further rights under contract or other applicable law.

2 MCAR S 1.90715 Time for implementation.

602, 906

A. Plan for correction. The manufacturer shall complete implementation of the plan for correction approved under 2 MCAR S 1.90708 E. on or before the deadline established in the plan as required by 2 MCAR S 1.90713 E. The deadline shall allow a reasonable amount of time to complete the plan, taking into account the seriousness of the problem, the number of manufactured homes involved, the immediacy of any risk, and the difficulty of completing the action. The seriousness and immediacy of any risk shall be given greater weight than other considerations. If a manufacturer is required to correct an imminent safety hazard or serious defect under 2 MCAR S 1.90710, the deadline shall be no later than 60 days after approval of the plan.

B. Notifications and corrections. The manufacturer shall complete the implementation of any notifications and corrections

being carried out under an order of the commissioner under 2 MCAR S 1.90711 C. on or before the deadline established in the order. In establishing each deadline, the commissioner shall allow a reasonable time to complete all notifications and corrections, taking into account the seriousness of the imminent safety hazard, serious defect, defect, or noncompliance; the number of manufactured homes involved; the location of the homes; and the extent of correction required. In no case shall the time allowed exceed the following limits:

1. 30 days after the issuance of final determination of imminent safety hazard; and

2. 60 days after the issuance of final determination of serious defect, defect, or noncompliance.

C. Extension of time. The commissioner shall grant an extension of the deadlines included in a plan or order if the manufacturer requests extension in writing and shows good cause for the extension and if the commissioner is satisfied that the extension is justified in the public interest. When the commissioner grants an extension, the commissioner shall notify the manufacturer and forward to the secretary a draft notice of the extension to be published in the Federal Register.

2 MCAR S 1.90716 Completion of remedial actions and report.

A. Notification. Where a manufacturer is required to provide notification under 2 MCAR SS 1.90702-1.90720, the manufacturer shall maintain in its files for five years from the date the notification campaign is completed a copy of the notice sent and a complete list of the names and addresses of those persons notified. The files shall be organized so that each notification and correction campaign can be readily identified and reviewed by the commissioner.

B. Correction. Where a manufacturer is required to provide correction under 2 MCAR S 1.90710 or where the manufacturer otherwise corrects under 2 MCAR S 1.90708 or 2 MCAR S 1.90711 E., the manufacturer shall maintain in its files, for five years from the date the correction campaign is completed, one of the following, as appropriate for each manufactured home involved:

1. Where the correction is made, a certification by the manufacturer that the repair was made to satisfy completely the standards in effect at the time the manufactured home was manufactured and that any imminent safety hazard has been eliminated; or

2. Where the owner refuses to allow the manufacturer to repair the home, a certification by the manufacturer that the owner has been informed of the problem which may exist in the manufactured home, that the owner has been informed of any risk to safety or durability of the manufactured home which may result from the problem, and that an attempt has been made to

repair the problems only to have the owner refuse the repair.

C. Additional notifications or corrections. If any actions taken under 2 MCAR SS 1.90702-1.90720 are not adequate under the approved plan or an order of the commissioner, the manufacturer may be required to provide additional notifications or corrections to satisfy the plan or order.

D. Report. The manufacturer shall, within 30 days after the deadline for completing any notifications and required corrections, under an approved plan or under an order of the commissioner, or any corrections required to obtain a waiver under 2 MCAR S 1.90708 G. or 2 MCAR S 1.90711 E., provide a complete report of the action taken to the commissioner who approved the plan under 2 MCAR S 1.90708 D., granted the waiver, or issued the order under 2 MCAR S 1.90711 C., and to any other state administrative agency or the secretary that forwarded a relevant complaint or information to the manufacturer under 2 MCAR S 1.90707.

602' 90e

2 MCAR S 1.90717 Correction of certain hazards and defects. If, in the course of making corrections under 2 MCAR S 1.90715, the manufacturer creates an imminent safety hazard or serious defect, the manufacturer shall correct the imminent safety hazard or serious defect under 2 MCAR S 1.90710.

602' 90e

2 MCAR S 1.90718 Manufactured homes in the hands of dealers and distributors.

A. Responsibility of manufacturer. The manufacturer is responsible for correcting any failures to conform and imminent safety hazards which exist in manufactured homes which have been sold or otherwise released to a distributor or dealer but which have not yet been sold to a purchaser. Generally this responsibility does not extend to failures to conform or imminent safety hazards that result solely from transit damages that occur after the manufactured home leaves the control of the manufacturer when the home is released by the manufacturer. Rule 2 MCAR S 1.90718 sets out the procedures to be followed by dealers and distributors for handling manufactured homes in these cases. Regardless of whether the manufacturer is responsible for repairing a manufactured home, no dealer or distributor may sell a manufactured home if it contains a failure to conform or an imminent safety hazard.

B. Notification and record. Whenever a dealer or distributor finds a problem in a manufactured home which the manufacturer is responsible for correcting, the dealer or distributor shall contact the manufacturer, provide full information concerning the problem, and request appropriate action by the manufacturer in accord with D. Where the manufacturer agrees to correct, the manufacturer shall maintain a complete record of its actions. Where the manufacturer authorizes the dealer to make the necessary corrections on a

reimbursable basis, the dealer or distributor shall maintain a complete record of its actions.

C. Amount of reimbursement. An agreement by the manufacturer to correct or to authorize corrections on a reimbursable basis constitutes the commissioner's determination, for purposes of section 613(b) of the act with respect to judicial review of the amount which the manufacturer agrees to reimburse the dealer or distributor for corrections.

D. Manufacturer's option. Upon a final determination by the commissioner under 2 MCAR S 1.90711, or upon a determination by the secretary or a court of competent jurisdiction that a manufactured home fails to conform to the standard or contains an imminent safety hazard after the manufactured home is sold or otherwise released by a manufacturer to a distributor or a dealer and prior to the sale of the manufactured home by the distributor or dealer to a purchaser, the manufacturer shall have the option to either:

1. Immediately furnish, at the manufacturer's expense, to the purchasing distributor or dealer the required conforming part or parts or equipment for installation by the distributor or dealer on or in the manufactured home, and the manufacturer shall reimburse the distributor or dealer for the reasonable value of the installation plus a reasonable reimbursement of not less than one percent per month of the manufacturer's or distributor's selling price prorated from the date of receipt by certified mail of notice of noncompliance to the date the manufactured home is brought into compliance with the standards, so long as the distributor or dealer proceeds with reasonable diligence with the installation after the part or component is received; or

2. Immediately repurchase, at the manufacturer's expense, the manufactured home from the distributor or dealer at the price paid by the distributor or dealer, plus all transportation charges involved and a reasonable reimbursement of not less than one percent per month of the price paid prorated from the date of receipt by certified mail of notice of the imminent safety hazard, serious defect, defect, or noncompliance to the distributor. The value of the reasonable reimbursements shall be fixed by mutual agreement of the parties or by a court in an action brought under section 613(b) of the act.

Rule 2 MCAR S 1.90718 does not apply to any manufactured home purchased by a dealer or distributor which has been leased by the dealer or distributor to a tenant for purposes other than resale. In that instance the dealer or distributor has the remedies available to a purchaser under 2 MCAR SS 1.90702-1.90720.

2 MCAR S 1.90719 Notices, bulletins, and other communications. At the time of dispatch, each manufacturer shall give to the commissioner a true or representative copy of all notices,

bulletins, and other written communications to the dealers or distributors of the manufacturers regarding any serious defect or imminent safety hazard which may exist in any manufactured homes produced by the manufacturer. Manufacturers shall keep complete records of all other communications with dealers, owners, and purchasers regarding noncompliances and defects.

602-906

2 MCAR S 1.90720 Supervision of notification and correction actions.

A. Notifications and corrections. The production inspection primary inspection agency in each manufacturing plant shall be responsible for assuring that notifications are sent to all owners, purchasers, dealers, or distributors of whom the manufacturer has knowledge under the requirements of the act. The production inspection primary inspection agency shall be responsible for assuring that the required corrections are carried out by auditing the certificates required by 2 MCAR S 1.90716.

B. Accomplishment of remedial actions. The commissioner or secretary to whom the report required by 2 MCAR S 1.90716 D. is sent shall be responsible for assuring through oversight that remedial actions described in the report have been carried out.

C. Inspection. The commissioner may inspect a manufactured home to determine whether any required correction is carried out to the approval plan, or, if there is no plan, to the standards or other approval obtained by the manufacturer.

602-906

2 MCAR S 1.90801 Reciprocity. Upon a showing that another state provides for the sealing of mobile homes upon compliance with standards which are at least equal to those provided in the code, the commissioner may provide that a construction seal affixed under the authority of such state shall have the same effect as a seal affixed under authority of this state, and thereafter any mobile home which bears the seal of such state shall not be required to bear the seal of this state as provided in 2 MCAR S 1.90201. The commissioner may make such reciprocity contingent upon such other granting reciprocal effect to seals affixed under authority of this state.

A. Pursuant to the provisions of 2 MCAR S 1.90801 the commissioner has established reciprocity with the following states which have granted reciprocity to the state of Minnesota:

1. State of Indiana

2. State of Illinois

3. State of Wisconsin

602-906

2 MCAR S 1.90802 Appeals. Any person aggrieved by application

of these rules may, within thirty (30) days of the time when his grievance arose, appeal to the commissioner. Upon receipt of a timely appeal and the submission of the appropriate fee pursuant to 2 MCAR S 1.90903 by appellant, the commissioner shall review the matter de novo and submit his written findings to appellant.

2 MCAR S 1.90803 Hearings and presentation of views meetings.

A. Policy. All hearings and presentations of views meetings shall be public.

B. Request. On receiving a request for a hearing or presentation of views meetings, the commissioner shall either grant the relief for which the hearing or presentation of views meeting is requested or shall issue a notice.

C. Notice. When the commissioner decides to conduct a presentation of views meeting, the commissioner shall provide notice as follows:

1. Except where the need for swift resolution of the question involved prohibits it, notice of a proceeding shall be published in the State Register at least ten days prior to the date of the proceeding. In any case, notice shall be provided to interested persons to the maximum extent practicable. Direct notice shall be sent by certified mail to the parties involved in the presentation of views meeting.

2. The notice, whether published or mailed, shall include a statement of the time, place, and nature of the proceeding; reference to the authority under which the proceeding will be held; a statement of the subject matter of the proceeding, the parties and issues involved; and a statement of the manner in which interested persons shall be afforded the opportunity to participate in the presentation of views meeting.

3. The notice shall designate the official who shall be the presiding officer for the proceedings and to whom all inquiries should be directed concerning the proceedings.

4. The notice shall state whether the proceeding shall be held in accordance with the provisions of D. In determining whether the requirements of D. shall apply, the commissioner shall consider the following: the need for quick action; the risk of injury to affected members of the public; the economic consequences of the decisions to be made; and other factors the commissioner considers appropriate.

5. Oral proceedings shall be stenographically or mechanically reported, or recorded, or transcribed, under the supervision of the presiding officer, unless the presiding officer and the parties otherwise agree, in which case a summary approved by the presiding officer shall be kept.

D. Presentation of views meetings.

1. A presentation of views meeting may be written or oral and may include an opportunity for an oral presentation, whether requested or not, whenever the commissioner concludes that an oral presentation would be in the public interest and states this in the notice. A presiding officer shall preside over all oral presentations. The purpose of these presentations shall be to gather information to allow fully informed decision making. Presentations of views meetings shall not be adversary proceedings. Oral presentations shall be conducted in an informal but orderly manner. The presiding officer shall have the duty and authority to conduct a fair proceeding, to take all necessary action to avoid delay, and to maintain order. In the absence of extraordinary circumstances, the presiding officer at an oral presentation of views meeting shall not require that testimony be given under oath or affirmation and shall not permit either cross-examination of witnesses by other witnesses or their representatives, or the presentation of rebuttal testimony by persons who have already testified. The rules of evidence prevailing in courts of law or equity shall not control the conduct of oral presentation of views meeting.

2. Within ten days after a presentation of views meeting, the presiding officer shall refer to the commissioner all documentary evidence submitted, any transcript that has been made, a summary of the issues involved, information presented in the presentation of views meeting, and the presiding official's recommendations with the rationale for them. The presiding officer shall make any appropriate statements concerning the apparent veracity of witnesses or the validity of factual assertions which may be within the competence of the presiding officer. The commissioner shall issue a final determination concerning the matters at issue within 30 days of receipt of the presiding officer's summary. The final determination shall include a statement of findings, with specific references to principal supporting items of evidence in the record and conclusions, as well as the reasons or bases for them upon all of the material issues of fact, law, or discretion as presented on the record; and an appropriate order. Notice of the final determination shall be given in writing and transmitted by certified mail, return receipt requested, to all participants in the presentation of views meeting. The final determination shall be conclusive with respect to persons whose interests were represented.

E. Hearings. Whenever the commissioner determines that a formal hearing is necessary in order to resolve the presentation of adversary views on matters governed by these rules, such hearing shall be conducted in accordance with the applicable provisions of Minnesota Statutes, chapter 15 governing contested case hearings and applicable provisions of the administrative rules of the Office of Administrative Hearings.

F. Public participation in presentation of views meetings.

1. Any interested persons may participate in writing in any presentation of views meeting held under the provision of

D. The presiding officer shall consider to the extent practicable any written materials.

2. Any interested person may participate in the oral portion of any presentation of views meeting held under D. unless the presiding officer determines that participation should be limited or barred so as not to prejudice unduly the rights of the parties directly involved or unnecessarily delay the proceedings.

602-9016

2 MCAR S 1.90901 Form and remittance. All remittances shall be:

A. In the form of checks or money orders;

B. Payable to Minnesota State Treasurer;

C. Addressed to:

State of Minnesota Building Code Division

408 Metro Square Building

7th and Robert Streets

St. Paul, Minnesota 55101

602-9016

2 MCAR S 1.90902 Fees for seals, construction compliance certificates, and labels.

A. Construction seal fees. Manufactured home and accessory structure construction seal fees are $5 per seal.

B. Installation seal fees. Manufactured home installation seal fees are $6 for a support/utility seal and $4 for an anchoring system seal.

C. Construction compliance certificate fee. The manufactured home and accessory structure construction compliance certificate fee is $10.

D. Label fee. The United States Department of Housing and Urban Development monitoring (label) fee is $19 per label. The United States Department of Housing and Urban Development monitoring (label) fee shall be paid by the manufacturer to the secretary.

602-9016

2 MCAR S 1.90903 Appeal fee. Appeal fee, twenty dollars ($20).

602-9016

2 MCAR S 1.90904 Annual registration fees. An installer shall pay a registration fee of $20 annually. The fee is due January 1 of each year.

602-905

2 MCAR S 1.90905 Other fees. For all other work performed by the Department of Administration such as, but not limited to, the review of plans, specifications, and independent agency reports, and quality control evaluation, a fee of $25 per man hour shall be charged.

602-906

2 MCAR S 1.90906 Reservation of rights. Nothing in 2 MCAR SS 1.90101-1.90906 shall limit the rights of the purchaser under any contract or applicable law.

Chapter 3 State Building Code Division

§ 1.10001 Purpose. These rules govern responsibilities undertaken pursuant to Minn. Stat. §§ 16.83 through 16.867. They relate to administration and enforcement of the State Building Code and the requirements for certification.

§ 1.10002 Definitions.

A. The terms used in rules 2 MCAR § 1.10001 through 2 MCAR § 1.10010 shall have the following meanings:

1. "Building Official" means the municipal building code administrative authority certified pursuant to Minn. Stat. § 15.861, subds. 2 and 3.

2. "Code" means the State Building Code pursuant to Minn. Stat. § 16.84, subd. 4.

3. "Commissioner" means Commissioner of Administration.

4. "Municipality" means an entity as described in Minn. Stat. § 16.84, subd. 3.

5. "State Building Inspector" means the person who, under the direction and supervision of the Commissioner, administers the State Building Code. State Building Code Division, 408 Metro Square Building, 7th and Robert Streets, St. Paul, Minnesota 55101.

§ 1.10003 Code adoption and amendments.

A. Pursuant to Minn. Stat. § 16.85, the code is adopted and periodically updated to include current editions of national model codes in general use and existing statewide specialty codes and amendments thereto.

B. Pursuant to Minn. Stat. § 16.86, subd. 6, amendments to the code may be proposed and initiated by any interested person, by the Building Code Standards Committee, or by subcommittees thereof.

Proposed amendments shall be submitted in writing on a form provided by the Commissioner.

§ 1.10004 Application for appeal.

A. Pursuant to Minn. Stat. § 16.863 any person aggrieved by the final determination of any municipality as to the application of the code may, within 30 working days of said decision, appeal to the Commissioner. The appeal shall be accompanied by a cashiers check, certified check, money order, or equivalent, payable in the amount of $20 to the "Commissioner of Administration."

B. The request for appeal shall contain the following:

1. name and address of applicant appealing the decision;

2. attorney representing applicant, if any;

3. municipality information including name of municipality, building official, and the local appeal board chairman;

4. property description, including address of property involved;

5. description of structure, including occupancy, size, construction type;

6. a copy of the municipality's written decision;

7. specific nature of appeal, including but not limited to the following:

a. code section(s) which are applicable to the specific question;

b. code section(s) that may indirectly apply;

c. listing of issues involved;

8. any other relevant information requested in writing by the Commissioner.

C. The Commissioner shall arrange for the State Hearing Examiner's Office to conduct a hearing on said appeal pursuant to Minn. Stat. §§ 15.0418 through 15.0426.

D. Copies of all final determinations of the Commissioner shall be sent to the appellant and the municipality involved or the attorney representing the appellant municipality.

§ 1.10005 State surcharge fees. All municipal permits issued for work pursuant to the State Building Code shall be subject to a surcharge fee. Said fees are established by Minn. Stat. § 16.866. Reports and remittances by municipalities shall be filed with the Commissioner.

A. All surcharge fees imposed by the State shall be in addition to municipal permit fees.

B. Surcharge report forms and information may be obtained by writing the Commissioner to the attention of the State Building Inspector.

§ 1.10006 State Building Code information and assistance. Any building code information or assistance may be obtained by contacting the State Building Inspector in writing or by telephone.

§ 1.10007 Education and training. Within limitations of personnel and funds the State Building Inspector shall provide training programs for municipal building officials, legislative bodies, administrative staff persons, design professionals, construction industry and the general public.

Information concerning training program availability may be obtained from the State Building Inspector by written or telephone inquiry.

§ 1.10008 Building official certification. This rule establishes procedures for certification of building officials, establishes prerequisites for persons applying to be certified by examination and establishes two classes of certification.

A. All building officials shall be certified in one of the following:

1. Class I certification shall permit building code administration limited to evaluation and inspection of one and two family dwellings and their accessory structures.

2. Class II certification shall permit building code administration including evaluation and inspection of all buildings and structures within the scope of the Code.

B. Before making application for Class I certification each individual shall meet the following prerequisites:

1. 3 years experience in any of the skilled construction trades; or

2. 3 years experience in complete design of 1 and 2 family dwellings and accessory buildings thereto; or

3. 2 years experience in municipal building construction inspection; or

4. 24 credits in Building Inspection Technology program in a community college system, plus one year experience in B. 1., B. 2., or B. 3. of this rule.

Building Inspection Technology courses must include courses in Field Inspection, Plan Review Non-structural, Plan Review Structural, Administration, Building Codes and Standards and Energy Conservation; or

5. International Conference of Building Officials certification in building inspection, plus one year experience in B. 1., B. 2., or B. 3. of this rule; or

6. 2 years in post high school construction oriented architectural or engineering courses, plus one year experience in B. 1., B. 2., or B. 3. of this rule.

C. Before making application for Class II certification, each individual shall meet the following prerequisites:

1. 5 years experience in one or a combination of the prerequisites described in B. 1., B. 2., or B.3. of this rule; and two years of general construction supervision or building code administration experience which may be concurrent with the required five years experience; or

2. 24 credits in Building Inspection Technology program in a community college system, plus three years experience in one, or a combination of prerequisites described in B. 1., B. 2., or B. 3. of this rule, and two years of general construction supervision or building code administration experience which may be concurrent with the required three years experience; or

3. International Conference of Building Officials certification in building inspection; and 3 years experience in one or a combination of prerequisites described in B. 1., B. 2., or B. 3. of Section B. of this rule; and two years of general construction supervision or building code administration experience which may be concurrent with the required three years experience; or

4. 2 years in a post high school course in construction or construction oriented, architectural or engineering courses plus three years experience in one, or a combination of prerequisites described in B. 1., B. 2., or B. 3. of this rule, and two years of general construction supervision or building code administration experience which may be concurrent with the required three years experience.

D. Each person seeking certification as a building official shall submit a completed application to the State Building Inspector with a $20 fee payable to the State of Minnesota on application forms provided by the Commissioner.

1. The State Building Inspector shall review applications for compliance with prerequisites set forth in sections B. and C. of this rule.

2. The State Building Inspector shall forward the application to the State Department of Personnel for examination if the prerequisites set forth in sections B. and C. of this rule are satisfied.

E. The examination shall be given by the State Department of Personnel pursuant to the rules of that department, as governed by and consistent with Minn. Stat. § 16.861, subd. 3 and the following:

1. If the applicant fails the examination, or fails to appear, the applicant shall be permitted to retake the examination or be scheduled for a second administration following 30 calendar days after test results notification.

2. If the applicant fails the examination a second time, or fails to appear for a second scheduled administration, the applicant shall wait six months and then may resubmit application pursuant to section D. of this rule.

§ 1.10009 Removal from office and revocation of certification. Pursuant to Minn. Stat. § 16.861, subd. 5, upon notice and hearing, a building official may be removed from office and his certification shall be revoked, when competent evidence is submitted to the Commissioner indicating that a building official has consistently failed to act in the public interest in performance of his duties. A hearing shall be held pursuant to the provisions of Chapter 15 governing contested case proceedings.

§ 1.10010 Plan review function. Within the limitations of personnel and funds, or as required by law the State Building Inspector shall review plans, specifications, and related documents for compliance with the code.

A. Types of plan review include:

1. plans of buildings required to be submitted to any state agency include, but are not limited to:

a. state-owned buildings;

b. buildings licensed by state agencies;

c. buildings financed in whole or in part by state funds;

2. manufactured buildings in which all elements of the total assembly cannot be visually inspected on site;

3. plans submitted by municipal inspection departments for review.

B. Content of plan review.

1. The plan review function, for structures in Section A. 1. and A. 3. of this rule, applies to nonstructural code requirements. The structural portion of a plan shall be reviewed to determine that the professional engineer has considered the minimum loading requirements of the code, but shall not include review for accuracy of structural design and calculations.

2. The plan review function for Section A. 2. structures applies to all aspects of code application and shall be marked approved by the State Building Inspector.

C. For plan review the following material shall be submitted:

One set of plans, specifications, and other relevant documents necessary to evidence code compliance, together with a transmittal letter shall be sent to the State Building Inspector, State Building Code Division, 408 Metro Square Building, 7th and Robert Streets, St. Paul, Minnesota 55101. Manufactured building submittals shall include two sets of plans, specifications, and other relevant documents.

D. The State Building Inspector shall review submittals and forward writ-

ten comments on items not in compliance with the code. The letter shall be mailed to the following:

1. municipal building official;

2. designer of plans and specifications;

3. state agencies involved, if applicable.

E. The State Building Inspector may contract for plan review as required by this section with any municipality the State Building Inspector determines is properly staffed and qualified to perform the plan review function. No fees shall be paid by the State to any municipality performing said contract function. The municipality shall charge its standard plan review fee directly to the applicant for a building permit.

F. Fees.

1. No fee shall be charged for the review of submittals listed in section A. 1. of this rule.

2. Fees shall be charged for review of plans submitted as described in sections A. 2. and A. 3. of this rule.

3. Fees shall be as required in 2 MCAR §§ 1.10107 and 1.10335.

THE COMPOSITION AND USE OF THE MINNESOTA STATE BUILDING CODE

The State Building Code, to be known as the "Code", includes several documents or codes pertaining to buildings. They are as follows:

1. State Building Code rules will be known and identified by 2 MCAR § 1.0101 through 2 MCAR § 1.18901.

2. The State Building Code adopts by reference the following codes:

(a) 1979 Edition of the Uniform Building Code, identified as "UBC";

(b) 1978 National Electrical Code, identified as "NEC";

(c) 1978 American National Standard Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks, identified as ANSI A17.1-1978, and Supplements ANSI A17.1a-1979.

(d) 1979 Minnesota Plumbing Code, identified as MHD 120 through MHD 135;

(e) "Flood Proofing Regulations" (FPR), Office of the Chief Engineers, U.S. Army.

(f) One and Two Family Dwelling Code, 1975 Edition.

3. Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code, identified as SBC 7101 through SBC 8505.

4. "Design and Evaluation Criteria for Energy Conservation in New Buildings, Additions and Remodeled Elements of Buildings and Standards for Certain Existing Public Buildings," identified as 2 MCAR § 1.16001 through 2 MCAR § 1.16006. (2 MCAR § 1.16007 through 2 MCAR § 1.16013 reserved for future use.)

5. Standards of Performance for Solar Energy Systems and Subsystems Applied to Energy Needs of Buildings, 1977 Edition, identified as 2 MCAR § 1.16101 through 2 MCAR § 1.16107.

6. State of Minnesota Mobile Home Installation Standards 1977, identified as 2 MCAR § 1.90450 and related definitions in 2 MCAR § 1.90103.

7. Certain appendices which contain the listing of various National Standards referred to in the body of the code; technical requirements for fallout shelters; and various chapters of those codes adopted by reference which chapters may be adopted by municipalities and administered and enforced by such municipalities. The Code is to be used in its entirety by the municipali-

ties in administering and enforcing the Code as well as by designers and builders in their designs and construction of structures. It is necessary to use the entire Code to ensure uniformity in compliance with the Code as well as uniformity in its administration and enforcement.

The above referenced Minnesota State Building Code and Minnesota Plumbing Code are available from the Department of Administration, Documents Section, 117 University Avenue, St. Paul, Minnesota 55155.

Other codes are available from the publishers of the codes.

(a) Uniform Building Code:
International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

(b) National Electrical Code:
National Fire Protection Association
470 Atlantic Avenue
Boston, Massachusetts 02110

(c) American National Standard Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks:
American Society of Mechanical Engineers
United Engineering Center
345 East 47th Street
New York, New York 10017

(d) ASHRAE Standard 90-75:
American Society of Heating, Refrigeration, and Air-Conditioning Engineers Inc.
345 East 47th Street
New York, New York 10017

(e) One and Two Family Dwelling Code:
International Conference of Building Officials
5360 South Workman Mill Road
Whittier, California 90601

Minnesota State Building Code

§ 1.10101 Title, rules and regulations. The rules and regulations contained in this Code and rules and standards adopted by reference therein shall be collectively known as the Minnesota State Building Code, and may be cited as such and will be referred to herein as "this Code". The administrative chapters of the UBC (Chapter 1, 2 and 3), as amended herein, shall govern the application of the Code.

§ 1.10102 Purpose and application. The purpose of this Code is to provide uniform standards to safeguard life or limb, health, property and public welfare by regulating and controlling design, construction, quality of materials, use and occupancy of all buildings and structures.

The State Building Code shall apply state wide and supersede the building code of any municipality. The State Building Code shall not apply to agricultural buildings except with respect to state inspections required or rulemaking authorized.

§ 1.10103 Definitions. Wherever the term "Administrative Authority" appears in this Code the words "Building Official" shall be substituted therefore.

Wherever the terms "Mayor" or "City Council" appear in this Code the words "Governing Body" shall be substituted therefore.

A. "City" means a home rule charter or statutory city.

B. "Code" means the State Building Code or any amendments thereof.

C. "Municipality" means any city, county, or town.

D. "Town" shall be defined as a town meeting the requirements of Minnesota Statutes 368.01.

§ 1.10104 Scope. The provisions of this Code shall apply to the construction, alteration, moving, demolition, repair and use of any building or structure within the municipality, except work located primarily in a public way, public utility towers and poles, mechanical equipment not specifically regulated in this Code, and hydraulic flood control structures.

Additions, alterations, repairs and changes of use or occupancy in all buildings and structures shall comply with the provisions for new buildings and structures except as otherwise provided in UBC Sections 104, 307, and 502 of this Code. Where, in any specific case, different sections of this Code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

Whenever in this Code reference is made to the Appendix, the provisions in the Appendix shall not apply unless specifically adopted.

The provisions of this Code relating to fallout shelters shall apply only to state-owned buildings.

§ 1.10105 Fallout shelters. Whenever it has been determined by the Department of Public Safety, Division of Civil Defense and the State Architectural Engineer that fall-out protection is needed for a particular location the "Technical Requirements for Fallout Shelters" as contained in Appendix "A" shall be complied with.

§ 1.10106 State-owned buildings. State owned buildings shall mean all buildings and structures financed in whole or in part by state funds and which are under the exclusive jurisdiction and custodial control of one or more state department or agencies.

§ 1.10107 State plan checking fees. Plan checking of buildings or structures conducted by the Division shall have a fee based on valuation in accordance with Table No. 107-A. "Valuation" means total cost of construction exclusive of site work not related to the construction.

EXCEPTION: When the Plan Review is limited to non-structural aspects, the fee shall be 75% of those listed in Table 107-A.

There shall be no additional fee charge for consultation with designers, or for re-checking provided no substantial change in the design has been made. When a determination is made by the Division that a substantial change has been made in the design, the re-checking fee shall be $15.00 per hour or fraction thereof. No fee shall be charged for state-owned buildings.

TABLE NO. 107-A

Valuation		Plan Fee Check
$ 3,000.00 or less		No Charge
3,001.00 to	5,000.00	$ 21.00
5,001.00 to	10,000.00	34.00
10,001.00 to	15,000.00	47.00
15,001.00 to	20,000.00	60.00
20,001.00 to	25,000.00	72.00
25,001.00 to	30,000.00	83.00
30,001.00 to	35,000.00	93.00
35,001.00 to	40,000.00	102.00
40,001.00 to	45,000.00	112.00
45,001.00 to	50,000.00	122.00
50,001.00 to	55,000.00	129.00
55,001.00 to	60,000.00	135.00
60,001.00 to	65,000.00	142.00
65,001.00 to	70,000.00	148.00
70,001.00 to	75,000.00	155.00

TABLE NO. 107-A (Cont.)

Valuation	Plan Fee Check
$ 75,001.00 to 80,000.00	$161.00
80,001.00 to 85,000.00	168.00
85,001.00 to 90,000.00	174.00
90,001.00 to 95,000.00	181.00
95,001.00 to 100,000.00	187.00
100,001.00 to 500,000.00	187.00 for the first $100,000.00 plus $1.00 for each additional $1,000.00 or fraction thereof.
500,001.00 and up	577.00 for the first $500,000.00 plus $ .65 for each additional $1,000.00 or fraction thereof.

§ **1.10108 Disclaimer clause.** The inclusion of specific requirements relative to the manner of installation of any plant or equipment in any one or more parts of said Code shall not limit this procedure to any particular type of installer nor provide a basis upon which determination of the right to perform such procedures shall be made. The authority for such determination will be found in the various licensing statutes or ordinances for each type of installer who performs the work.

§ **1.10109 Appendices.**

A. The following appendices, annexes and supplemental material listed in this Code shall be mandatory to enforce by any municipality.

1. Minnesota State Building Code Appendix "A", Technical Requirements for Fallout Shelter.

2. Minnesota State Building Code Appendix "B", Variation in Snow Loads.

3. 1979 UBC Appendix, Chapter 35.

4. Minnesota Plumbing Code Appendix B.

B. The following appendices, annexes and supplemental material listed in this Code shall not be mandatory but may be adopted without change at the discretion of any municipality, except UBC Appendix Chapter 70 may be adopted with revised fee and bond requirements.

1. Minnesota State Building Code. Appendix "C" abbreviations and addresses of Technical Organizations.

2. 1979 UBC Appendix, Chapters 12, 38, 48, 49, 55, and 70. UBC appendices not listed as mandatory or optional are not incorporated in the State Building Code.

3. Minnesota Plumbing Code Appendices C and D.

4. Flood Proofing Regulations, Sections 201.2 through 208.2.

5. Minnesota State Building Code Appendix "D", Building Security Sections 4101-4110.

§ 1.10110 Reserved for future use. For Flood Proofing Regulations, see § 1.18901.

§ 1.10111 Adoption of the Uniform Building Code by reference. Chapters 1 through 60 and appendices of the 1979 Edition of the Uniform Building Code, hereinafter "UBC", as promulgated by the International Conference of Building Officials, are incorporated by reference and hereby made part of the State Building Code (SBC) except as qualified by 2 MCAR § 1.10109. Said UBC shall be subject to the following alterations and amendments:

UBC §§ 101, 102 and 103 are deleted in their entirety.

UBC § 104(a) is amended by changing the last sentence and adding a sentence to read: See § 1210 for provisions requiring installation of smoke detectors in existing Group R, Division 3 or 4 Occupancies. Unsafe conditions as defined in § 203 shall be abated.

UBC § 104(f) is amended by adding an additional item number 4 as follows:

4. All approvals must be based on the applicants submission of complete architectural and engineering plans and specifications.

UBC § 203 is amended to read as follows:

UBC § 203. All buildings or structures regulated by this code which are structurally unsafe or not provided with adequate egress, or which constitute a fire hazard, or are otherwise dangerous to human life are, for the purpose of this section, unsafe. Any use of buildings or structures constituting a hazard to safety, health or public welfare by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, disaster, damage or abandonment are, for the purpose of this section, unsafe uses. Parapet walls, cornices, spires, towers, tanks, statuary and other appendages or structural members which are supported by, attached to, or part of a building and which are in deteriorated condition or otherwise unable to sustain the design loads which are specified in the Building Code are hereby designated as unsafe building appendages.

All such unsafe buildings, structures or appendages are hereby declared to be

public nuisances and shall by abated by repair, rehabilitation, demolition or removal in accordance with the procedures set forth in Minnesota Statutes, Chapter 463 Sections 15 through 26.

UBC § 204 is amended by amending the last sentence as follows: The Board shall adopt reasonable rules and regulations for conducting its investigations and shall render all decisions and findings in writing to the Building Official with a duplicate copy to the appellant and to the State Building Inspector within fifteen (15) days of such decision.

UBC § 205 is amended by adding a sentence as follows: Any violation of provisions of this code is a misdemeanor (Minn. Stat. § 16.865).

UBC § 301(a) is amended by the addition of item 12 as follows:

12. Agricultural buildings as defined in Minn. Stat. § 16.84, subd. 6.

§ 304(a) of the UBC is amended to read as follows:

UBC § 304. (a) Permit Fees. The fee for each permit shall be as set forth in Table 3-A. Each municipality shall adopt its own schedule of permit fees. The fee schedule of Table 3-A is hereby made optional for use by the local authority and is a recommended schedule. In areas outside of the enforcement authority of a city, the fee charged for the issuance of permits and inspections for single family dwellings may not exceed the greater of $100 or .005 times the value of the structure, addition or alteration. (Minn. Stat. § 16.851.)

The determination of value or valuation under any of the provisions of this code shall be made by the building official. The value to be used in computing the building permit and building plan review fees shall be the total value of all construction work for which the permit is issued as well as all finish work, painting, roofing, electrical, plumbing, heating, air conditioning, elevators, fire-extinguishing systems and any other permanent equipment.

§ 305(e) of the UBC is amended to read as follows:

UBC § 305(e) Required Inspections. Reinforcing steel or structural framework of any part of any building or structure shall not be covered or concealed without first obtaining the approval of the building official.

The building official, upon notification from the permit holder or his agent, shall make the following inspections and shall either approve that portion of the construction as completed or shall notify the permit holder or his agent wherein the same fails to comply with this code:

1. FOUNDATION INSPECTION: To be made after trenches are excavated and forms erected and when all materials for the foundation are delivered on the job. Where concrete from a central mixing plant (commonly termed "transit mixed") is to be used, materials need not be on the job.

2. CONCRETE SLAB OR UNDER-FLOOR INSPECTION: To be made after all in-slab or under-floor building service equipment, conduit, piping accessories and other ancillary equipment items are in place but before any concrete is poured or floor sheathing installed, including the subfloor.

3. FRAME INSPECTION: To be made after the roof, all framing, fire blocking and bracing are in place and all pipes, chimneys and vents are complete and the rough electrical, plumbing and heating wires, pipes and ducts are approved.

4. INSULATION INSPECTION: To be made after all required insulation is in place but before any covering material is in place.

5. LATH AND/OR GYPSUM BOARD INSPECTION: To be made after all lathing and gypsum board, interior and exterior, used as a structural element or a part of a fire resistive assembly, is in place but before any plastering is applied or before gypsum board joints and fasteners are taped and finished.

6. FINAL INSPECTION: To be made after finish grading and the building is completed and ready for occupancy.

7. INSTALLATION OF MOBILE HOMES: To be made after the installation of the support system and all utility service connections. This shall include the inspection of the anchoring system where installed.

§ 307(a) of the UBC is amended to read as follows:

Certificate of Occupancy

§ 307(a) Use or Occupancy. No building or structure of Groups A, E, I, H, B, or R, Division 1 Occupancy, shall be used or occupied, and no change in the existing occupancy classification of a building or structure or portion thereof shall be made until the Building Official has issued a Certificate of Occupancy therefore as provided herein. A municipality may require certificates of occupancy for Group R3, R4 and Group M Occupancies.

§ 405 of the UBC, Definition of Dwelling shall be amended to read:

DWELLING is any building or any portion thereof which is not an "Apartment House", "Lodging House" or a "Hotel" as defined in this code, which contains one or two "Dwelling Units" or "Guest Rooms", used, intended or designed to be built, used, rented, leased, let or hired out to be occupied, or which are occupied for living purposes and shall include Class A-1 Supervised Living Facilities as defined in § 420.

§ 406 of the UBC is amended by the addition of the following definition:

EARTH SHELTERED STRUCTURE is a building constructed so that more than 50 percent of the exterior surface area of the building, excluding

garages or other accessory buildings, is covered with earth. Partially completed buildings shall not be considered to be earth sheltered. (See Minn. Stat. § 116H.02, subd. 3.)

§ 407 of the UBC Definition of Fire Code is amended as follows:

UBC § 407. FIRE CODE is the Minnesota Uniform Fire Code, authorized by Minn. Stat. § 299F.011.

UBC § 414 Definition of Mechanical Code is amended as follows:

UBC § 414 MECHANICAL CODE is the Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code.

§ 420 of the UBC is amended by adding the following definitions.

"Supervised Living Facility" means a facility in which there is provided supervision, lodging, meals, and, in accordance with the provisions of rules of the Department of Public Welfare, counseling and developmental habilitative or rehabilitative services to five or more persons who are mentally retarded, chemically dependent, adult mentally ill or physically handicapped.

"Class A Supervised Living Facility" means a Supervised Living Facility for ambulatory and mobile persons who are capable of taking appropriate action for self-preservation under emergency conditions as determined by program licensure provisions.

Class A-1 supervised living facilities shall include homes providing boarding and lodging for 6 or fewer ambulatory or mobile disabled persons.

Class A-2 supervised living facilities shall include homes providing boarding and lodging for more than 6 ambulatory or mobile disabled persons.

"Class B Supervised Living Facility" means a Supervised Living Facility for ambulatory, non-ambulatory, mobile or non-mobile persons who are not mentally or physically capable of taking appropriate action for self-preservation under emergency conditions as determined by program licensure provisions.

UBC Table 5-A, Group I-1, I-2, R1 and R3 are amended to read as follows:

UBC § 501 Table 5-A.

I.1 - Nurseries for full-time care of children under the age of six (each accommodating more than four persons). Hospitals, sanitariums, nursing homes and similar buildings (each accommodating more than four persons).

I.2 - Detoxification centers, homes for children six years of age or over, supervised living facilities Class B as defined in UBC § 420, for the mentally retarded, mentally ill or the physically handicapped (each accommodating more than four persons).

R.1 - Hotels and apartment houses, convents and monasteries (each accommodating more than 10 persons). Supervised living facilities Class A2 as defined in UBC § 420 (accommodating more than six persons).

R.3 - Dwellings and lodging houses. Supervised living facilities Class A-1 as defined in UBC § 420 (each accommodating six or fewer persons).

§ 503(d) Exception 4 is amended to read as follows:

EXCEPTION 4. In the one-hour occupancy separation between a Group R, Division 3 and M occupancy, the separation may be limited to the installation of one half inch thick gypsum board, or equivalent, on the garage side and a tight-fitting solid wood door 1-3/8 inches in thickness will be permitted in lieu of a one-hour fire assembly. Fire dampers shall not be required in ducts piercing this separation for ducts constructed of not less than No. 26 gauge galvanized steel.

Chapter 5 of the UBC is amended by adding a new section to read as follows:

UBC § 512 Roof Access. Unless specifically exempted by the Building Official due to space limitation, roof height above grade or other special considerations, buildings on which any heating, air conditioning, or refrigeration equipment is hereafter installed on the roof and which equipment will require periodic inspection, service and maintenance in accordance with the mechanical code SBC 7101-8810 shall meet the following requirements:

A stairway complying with UBC Chapter 33 or a stair leading to a scuttle or bulkhead in the roof having such equipment shall be provided to make such equipment safely accessible. Said stair leading to the scuttle or bulkhead shall be placed at an angle of not more than 60 degrees measured from the horizontal with flat treads not less than six inches in width and a minimum length of 24 inches at the tread. No riser shall be more than nine inches and handrails shall be provided on both sides of the access stairs. The minimum opening of the scuttle or bulkhead shall be not less than nine square feet in area with the minimum dimension being not less than two feet. In no case shall this required access be located in or pass through the elevator shaft or elevator machine room.

Equipment should be located with at least six feet of clearance from the edge of the roof or similar hazards. If the clearance is less than six feet, a suitable rail or guard not less than forty-two inches in height shall be provided.

Each unit of equipment shall have an accessible disconnect switch. A 20 ampere 110-120 volt AC ground type convenience outlet shall be installed on or adjacent to the unit or equipment. The circuit for this convenience outlet shall be approved ground-fault protection and shall not be connected to the equipment circuit.

§ 605 of the UBC is amended to read as follows:

UBC § 605. All enclosed portions of Group A Occupancies customarily used by human beings and all dressing rooms shall be provided with natural light by means of exterior glazed openings with an area not less than one-tenth of the total floor area, and natural ventilation by means of openable exterior openings with an area of not less than one-twentieth of the total floor area or shall be provided with artificial light and a mechanically operated ventilating system. The mechanically operated ventilating systems shall supply a minimum of 5 cubic feet per minute of outside air with a total circulated of not less than 15 cubic feet per minute per occupant in all portions of the building and such system shall be kept continuously in operation during such time as the building is occupied. If the velocity of the air at the register exceeds 10 feet per second, the register shall be placed more than 8 feet above the floor directly beneath.

Exit lighting in portions of buildings other than the stage shall be on a separate circuit from that of the stage. Such exit lighting shall be controlled from the box office or other approved central control center located in a portion of the building other than the stage. All lights in corridors, exit courts and exit passageways shall be protected by a wire cage.

All registers or vents supplying air backstage shall be equipped with automatic closing devices with fusible links. Such closing devices shall be located where the vents or ducts pass through the proscenium walls and shall be operated by fusible links located on both sides of the proscenium wall and both inside of and outside of the vent or duct.

There shall be provided in an approved location at least one lavatory for each two water closets for each sex, and at least one drinking fountain for each floor level.

For other requirements on water closets, see § 1711 as amended herein.

For additional sanitation facilities requirements, see UBC § 1711(h) as specified herein.

§ 705 of the UBC is amended to read as follows:

UBC § 705. All portions of Group B Occupancies shall be provided with natural light by means of exterior glazed openings with an area equal to one-tenth of the total floor area, and natural ventilation by means of exterior openings with an area not less than one-twentieth of total floor area, or shall be provided with artificial light and mechanically operated ventilating system as specified in § 605 and the applicable sections of the mechanical code.

In all buildings or portions thereof where flammable liquids are used, exhaust ventilation shall be provided sufficient to produce four air changes per hour. Such exhaust ventilation shall be taken from a point at or near the floor level.

In all enclosed parking garages used for storing or handling of automobiles operating under their own power and on all loading platforms in bus termi-

nals, ventilation shall be provided capable of exhausting a minimum of 3/4 cfm per square foot of gross floor area. The building official may approve an alternate ventilation system designed to exhaust a minimum of 14,000 cfm for each operating vehicle. Such system shall be based upon the anticipated instantaneous movement rate of vehicles but not less than 2.5 percent (or one vehicle) of the garage capacity. Automatic CO sensing devices may be employed to modulate the ventilation system to maintain a maximum average concentration of CO of 50 ppm during any eight-hour period, with a maximum concentration not greater than 200 ppm for a period not exceeding one hour. Connecting offices, waiting rooms, ticket booths, etc., shall be supplied with conditioned air under positive pressure.

EXCEPTION: In gasoline service stations without lubrication pits, storage garages and aircraft hangars not exceeding in area of 5000 square feet, the building official may authorize the omission of such ventilating equipment where, in his opinion, the building is supplied with unobstructed openings to the outer air which are sufficient to provide the necessary ventilation.

Every building or portion thereof where persons are employed shall be provided with at least one water closet. Separate facilities shall be provided for each sex when the number of employees exceeds four and both sexes are employed. Such toilet facilities shall be located either in such building or conveniently in a building adjacent thereto on the same property.

Such water closet rooms in connection with food establishments where food is prepared, stored or served shall be a nonabsorbent interior finish as specified in § 1711, shall have hand-washing facilities therein or adjacent thereto, and shall be separated from food preparation or storage rooms as specified in § 510.

All water closet rooms shall be provided with an exterior window at least 3 square feet in area, fully openable; or a vertical duct not less than 100 square inches in area for the first toilet facility, with an additional 50 square inches for each additional toilet facility; or a mechanically operated exhaust system, which is connected to the light switch, capable of providing a complete change of air every 15 minutes. Such systems shall be vented to the outside air and at the point of discharge shall be at least 5 feet from any openable window.

For other requirements on water closets, see § 1711 as amended herein.

For additional sanitation facilities requirements, see UBC § 1711(h) as specified herein.

§ 709(e) of the UBC is amended to read as follows:

UBC § 709(e) Area and Height Increases. The area and height of structures with cross ventilation throughout may be increased in accordance with provisions of this subsection. In structures with sides open (as defined in Subsection (b)) three-fourths of the building perimeter may be increased 25 per-

cent in area and one tier in height. Structures with sides open (as defined in Subsection (b)) around the entire building perimeter may be increased 50 percent in area and one tier in height. Structures of Type II-FR, Type II-1 hr, or Type II-N construction, with sides open (as defined in subsection (b)) around the entire building, may be unlimited in area when the height does not exceed 8 tiers.

Open parking garages constructed to heights less than the maximums established by Table No. 7-A may have individual tier areas exceeding those otherwise permitted, provided the gross tier area of the structure does not exceed that permitted for the higher structure. At least three sides of each such larger tier shall have continuous horizontal openings not less than 30 inches in clear height extending for at least 80 percent of the length of the sides and no part of such larger tier shall be more than 200 feet horizontally from such an opening. In addition, each storage opening shall face a street or yard accessible to a street with a width of at least 30 feet for the full length of the opening and standpipes shall be provided in each tier.

§ 709 of the UBC is amended by adding a new paragraph (m):

UBC § 709(m) Every parking ramp or other parking facility shall include spaces for the parking of motor vehicles having a capacity of seven (7) to sixteen (16) persons. The number of required spaces shall be determined by 2% of the gross designed parking area with a minimum of two spaces. Such spaces to accommodate commuter vehicles, shall be at least 10 feet in width, 20 feet in length and a height clearance of 10'-6" in the entry level and shall not apply to other levels of a ramp.

§ 802(c) of the UBC is amended to read as follows:

UBC § 802(c) Special Provisions. Rooms in Divisions 1 and 2 Occupancies used for day-care purposes, kindergarten pupils and Division 3 Occupancies shall not be located above the first story, nor shall they be located in a basement unless there is provided at least one exit without intervening stairs directly on grade from the occupied space.

Storage and janitor closets shall be of one-hour fire-resistive construction. Stages and enclosed platforms shall be constructed in accordance with Chapter 39. For attic space partitions and draft stops, see § 3205.

§ 805 of the UBC is amended to read as follows:

UBC § 805. All portions of Group E Occupancies shall be provided with light and ventilation, either natural or artificial, as specified in § 605.

For other requirements on water closets, see § 1711 as amended herein.

For additional sanitation facilities requirements, see UBC § 1711(h) as specified herein.

§ 809 of the UBC is amended to read as follows:

UBC § 809. Approved fire alarms shall be provided for all Group E Occupancies with an occupant load of more than 50 persons, and in Group E Division 3 Occupancies with an occupant load of more than 29 persons. In every Group E Occupancy with an automatic sprinkler or detection system, the operation of such system shall automatically activate the school fire alarm system.

The fire alarm system shall be installed in compliance with NFPA Standard 72-A-75, "Local Protective Signaling Systems."

An approved fire alarm is a fire alarm and detection system consisting of the following:

1. A complete non-coded continuously sounding until manually reset, electronically supervised type.

2. Shall have sounding stations on 100 foot to 150 foot spacing; (a) in corridors, (b) in areas of high noise levels, such as band rooms, shops, boiler rooms, (c) a weatherproof station on exterior of building facing residential areas.

3. Shall have automatic sending stations (detectors) in boiler rooms, kitchens, shops, painting areas, lounges, laundries, janitor's closets, storerooms, etc., or unsupervised and unoccupied spaces; namely, critical or hazardous areas.

4. Manual sending stations shall be provided in the natural path of escape from fire, near each exit from an area, on each floor, and shall be readily accessible, unobstructed and at visible locations.

§ 905 of the UBC is amended to read as follows:

UBC § 905. All portions of Group H Occupancies shall be provided with natural light by means of exterior glazed openings with an area equal to one-tenth of the total floor area, and natural ventilation by means of exterior openings with an area not less than one-twentieth of the total floor area, or shall be provided with artificial light and a mechanically operated ventilating system as specified in § 605 and the applicable sections of the mechanical code.

In all buildings or portions thereof where flammable liquids are used, exhaust ventilation shall be provided sufficient to produce four complete air changes per hour. Such exhaust ventilation shall be taken from a point at or near the floor level.

In all buildings used for the repair or handling of automobiles operating under their own power, ventilation shall be provided capable of exhausting a minimum of 3/4 cfm per square foot. Additionally, each engine repair stall shall be equipped with an exhaust pipe extension duct, extending to the outside of the building, which, if over 10 feet in length, shall mechanically exhaust 300

cubic feet per minute. Connecting offices and waiting rooms shall be supplied with conditioned air under positive pressure.

EXCEPTION: In public repair garages and aircraft hangars not exceeding an area of 5000 square feet, the building official may authorize the omission of such ventilating equipment where, in his opinion, the building is supplied with unobstructed openings to the outer air which are sufficient to provide the necessary ventilation.

Every building or portion thereof where persons are employed shall be provided with at least one water closet. Separate facilities shall be provided for each sex when the number of employees exceeds four and both sexes are employed.

Such toilet facilities shall be located either in such building or conveniently in a building adjacent thereto on the same property.

All water closet rooms shall be provided with an exterior window at least 3 square feet in area, fully openable; or a vertical duct not less than 100 square inches in area for the first toilet facility, with an additional 50 square inches for each additional toilet facility; or a mechanically operated exhaust system, which is connected to the light switch, capable of providing a complete change of air every 15 minutes. Such systems shall be vented to the outside air and at the point of discharge shall be at least 5 feet from any openable window.

For other requirements on water closets, see § 1711 as amended herein.

For additional sanitation facilities requirements, see UBC § 1711(h), as specified herein.

§ 1001 of the UBC is amended to read as follows:

UBC § 1001. Group I Occupancies shall be:

Division 1. Nurseries for the full-time care of children under the age of six (each accommodating more than four persons). Hospitals, sanitariums, nursing homes and similar buildings (each accommodating more than four persons).

Division 2. Detoxification centers, homes for children six years of age or over, supervised living facilities Class B as defined for the mentally retarded, mentally ill or the physically handicapped (each accommodating more than four persons).

Division 3. Mental hospitals, mental sanitariums, jails, prisons, reformatories and buildings where personal liberties of inmates are similarly restrained.

For occupancy separations, see Table No. 5-B.

For occupant load, see § 3301.

EXCEPTION: Group I Occupancies shall not include buildings used only for private residential purposes for a family group.

§ 1002(b) of the UBC is amended to read as follows:

UBC § 1002(b) Special Provisions. Division 3 Occupancies shall be housed in buildings of Type I or Type II-F.R. construction.

Every story of a Group I, Division 1 Occupancy accommodating more than five nonambulatory persons, unless provided with a horizontal exit, shall be divided into not less than two compartments accommodating approximately the same number of nonambulatory persons in each compartment by a smoke-stop partition meeting the requirements of one-hour occupancy separation so as to provide an area of refuge within the building. Corridor openings in the smoke-stop partition shall be protected with doors as required in § 3304(h). Other openings shall be limited to ducts which have fire dampers in the plane of the wall activated by detectors of products of combustion other than heat conforming to § 4306(b) 2.

Rooms occupied by inmates or patients whose personal liberties are restrained shall have noncombustible floor surfaces.

§ 1005 of the UBC is amended to read as follows:

UBC § 1005. All portions of Group I Occupancies shall be provided with natural light by means of exterior glazed openings with an area equal to one-tenth of the total floor area, and natural ventilation by means of exterior openings with an area not less than one-twentieth of the total floor area, or shall be provided with artificial light and a mechanically operated ventilating system as specified in § 605 and the mechanical code.

For other requirements on water closets, see § 1711 as amended herein.

For additional sanitation facilities requirements, see UBC § 1711(h) as specified herein.

§ 1009 of the UBC is amended to read as follows:

UBC § 1009. An approved fire alarm system shall be provided for all Group I Occupancies. Audible alarm devices shall be used in all nonpatient areas. Visible alarm devices may be used in lieu of audible devices in patient-occupied areas. An approved alarm system shall comply with UBC § 809 as amended herein. Operation of any fire alarm activating device shall automatically, without delay, accomplish general alarm indication and control functions. Zoned, coded systems shall be permitted to be used. Exception: Alarm systems may be installed in accordance with NFPA 101, 1977 Edition, 10-3.3.3.

UBC § 1101 Group M, 6th line is amended to read as follows:

For occupancy separations, see Table No. 5-B. For purposes of occupancy separation, mobile homes shall be considered as Group R, Division 3.

§ 1201 of the UBC is amended by adding a new Division to read as follows:

UBC § 1201 Group R, Division 4 Occupancies: This use group shall include all one and two family dwellings built exclusively by the standards as established in the 1975 One and Two Family Dwelling Code as promulgated by the national model code organizations and 2 MCAR §§ 1.16001 through 1.16006. Use and installation of foam plastics shall comply with § 1717 of the UBC as amended herein.

EXCEPTION: The plumbing requirements found in Part V (Chapters 20 through 25) and the referenced portions of Part VII (2-26.2001-S-26.2103) are deleted in their entirety. The requirements of the Minnesota Plumbing Code for plumbing shall apply to this occupancy group.

UBC § 1201 Group R Division 1 occupancy definition is changed to read as follows:

Division 1. Hotels and apartment houses. Convents and monastaries (each accommodating more than 10 persons), Supervised living facilities Class A-2 as defined in § 420 for the mentally retarded, mentally ill, chemically dependent, and the physically handicapped (each accommodating more than four persons). Physically handicapped persons shall be housed at street level.

UBC § 1201 Group R, Division 3 is amended to read as follows:

UBC § 1201, Division 3. Dwellings and lodging houses, supervised living facilities Class A-1 as defined in Section 420. For occupancy separations, see Table No. 5-B.

§ R-202 of the One and Two Family Dwelling Code is amended to read as follows:

§ R-202. Buildings shall be constructed in accordance with the provisions of this Code using the design criteria set forth in Table No. 2-A. These criteria shall be established by the jurisdiction based solely or in part on the climatic and geographic conditions set forth in Appendix A. Roof snow loads shall be in accordance with 2 MCAR § 1.10111 - UBC § 2305(d). Frost line depth shall be in accordance with 2 MCAR § 1.10111 - UBC § 2907(a). Wind velocity shall be in accordance with the conditions set forth in Appendix A of the One and Two Family Dwelling Code.

§ R-204 of the One and Two Family Dwelling Code is amended to read as follows:

§ R-204. All habitable rooms shall be provided with aggregate glazing area of not less than 8 square feet nor 8 percent of the floor area of such rooms. One-half of the required area of glazing shall be openable.

EXCEPTION: The glazed areas need not be openable where an approved mechanical ventilation system is provided capable of producing a change of air every 30 minutes and the opening is not required by § R-211.

Bathrooms, water-closet compartments and other similar rooms shall be provided with aggregate glazing area in windows of not less than 3 square feet, one-half of which must be openable.

EXCEPTION: The glazed areas are not required where artificial light and an approved mechanical ventilation system is provided capable of producing a change of air every 12 minutes.

Required glazed openings shall open directly onto a street or public alley, or a yard or court located on the same lot as the building.

EXCEPTION: Required glazed openings may face into a roofed porch where the porch abuts a street, yard or court and the longer side of the porch is at least 65 per cent open and unobstructed and the ceiling height is not less than 7 feet.

§ R-211 of the One and Two Family Dwelling Code is amended to read as follows:

§ R-211 Exits. No less than one exit conforming to this Chapter shall be provided from each dwelling unit.

Every sleeping room shall have at least one operable window or exterior door approved for emergency egress of rescue. The units must be operable from the inside to a full clear opening without the use of separate tools. Where windows are provided as a means of egress or rescue they shall have a sill height of not more than 48 inches above the floor.

All egress or rescue windows from sleeping rooms must have a minimum net clear opening of 5.7 square feet. The minimum net clear opening height dimension shall be 24 inches. The minimum net clear opening width dimension shall be 20 inches.

§ 1204 of the UBC is amended to read as follows:

UBC § 1204. Stairs, exits and smokeproof enclosures shall be as specified in Chapter 33.

Every sleeping room below the fourth story shall have at least one operable window or exterior door approved for emergency egress or rescue.

The units shall be operable from the inside to provide a full clear opening without the use of separate tools.

All egress or rescue windows from sleeping rooms shall have a minimum net clear opening of 5.7 square feet. The minimum net clear opening height di-

mension shall be 24 inches. The minimum net clear opening width dimension shall be 20 inches. Where windows are provided as a means of egress or rescue they shall have finished sill height not more than 48 inches above the floor.

§ 1205 of the UBC is amended to read as follows:

UBC § 1205. (a) Light and Ventilation. All guest rooms, dormitories and habitable rooms within a dwelling unit shall be provided with natural light by means of exterior glazed openings with an area not less than 8 per cent of the floor area of such rooms with a minimum of 8 square feet. All bathrooms, water closet compartments, laundry rooms and similar rooms shall be provided with natural ventilation by means of openable exterior openings with an area not less than one-twentieth of the floor area of such rooms with a minimum of 1-1/2 square feet.

All guest rooms, dormitories and habitable rooms within a dwelling unit shall be provided with natural ventilation by means of openable exterior openings with an area of not less than 4 per cent of the floor area of such rooms with a minimum of 4 square feet.

In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing two air changes per hour in all guest rooms, dormitories, habitable rooms and in public corridors. One-fifth of the air supply shall be taken from the outside. In bathrooms, water closet compartments, laundry rooms and similar rooms a mechanical ventilations system connected directly to the outside, capable of providing five air changes per hour, shall be provided.

For the purpose of determining light and ventilation requirements, any room may be considered as a portion of an adjoining room when one-half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room or 25 square feet, whichever is greater.

Required exterior openings for natural light and ventilation shall open directly onto a street or public alley or a yard or court located on the same lot as the building.

EXCEPTION: Required windows may open into a roofed porch where the porch:

1. Abuts a street, yard, or court; and

2. Has a ceiling height of not less than 7 feet; and

3. Has the longer side at least 65 percent open and unobstructed.

(b) Sanitation. Every building shall be provided with at least one water closet. Every hotel or subdivision thereof where both sexes are accommodated shall contain at least two separate toilet facilities which are conspicu-

ously identified for male or female use, each which contains at least one water closet.

Additional water closets shall be provided on each floor for each sex at the rate of one for every additional 10 guests, or fractional part thereof, in excess of 10.

Every dwelling unit shall be provided with a kitchen equipped with a kitchen sink and with a bathroom equipped with facilities consisting of a water closet, lavatory and either a bathtub or shower. Each sink, lavatory and bathtub or shower shall be equipped with hot and cold running water necessary for its normal operation.

For other requirements on water closets, see §§ 510 and 1711 as amended herein.

For additional sanitation facilities requirements, see UBC § 1711(h), as specified herein.

§ 1210(a) of the UBC is amended to read as follows:

UBC § 1210. (a) Fire-warning Systems. Every dwelling unit and every guest room in a hotel or lodging house used for sleeping purposes shall be provided with smoke detectors conforming to U.B.C. Standard No. 43-6. In dwelling units, detectors shall be mounted on the ceiling or wall at a point centrally located in the corridor or area giving access to rooms used for sleeping purposes. In an efficiency dwelling unit, hotel sleeping room and in hotel suites, the detector shall be centrally located on the ceiling of the main room or hotel sleeping room. Where sleeping rooms are on an upper level, the detector shall be placed at the center of the ceiling directly above the stairway. All detectors shall be located in accordance with approved manufacturer's instructions. When actuated, the detector shall provide an alarm in the dwelling unit or guest room.

When alterations, repairs or additions requiring a permit and having a valuation in excess of $1000 occur, or when one or more sleeping rooms are added or created in existing Group R, Division 3 or 4 Occupancies, the entire building shall be provided with smoke detectors located as required for new Group R, Division 3 or 4 Occupancies.

In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection.

Smoke detectors may be battery operated when installed in existing buildings without commercial power, or in buildings which undergo alterations, repairs or additions regulated by the second paragraph of this section.

§ 1213 of the UBC is deleted in its entirety.

Chapter 12 of the UBC is amended by adding a new section to read as follows:

UBC § 1216 For Group R Division 1 Occupancies sound transmission control shall be provided to meet the standards defined in UBC Appendix Chapter 35.

Chapter 12 of the UBC is amended by adding a new section to read as follows:

UBC § 1217 Deadbolt Locks Required. All doors leading to public or shared areas from all apartment dwelling units and hotel units shall be provided with deadbolt locks, at least one of which must be capable of being locked from the exterior of said unit. For the purpose of this section a "deadbolt lock" is a locking bolt, which, when in the locked position, can only be moved positively by turning a knob, key or sliding bolt.

Deadbolt locks having a bolt moved by turning a key shall be of the five-pin tumbler type or an approved equivalent. Lock throw shall be not less than three-quarters inch (3/4"). Locks shall meet requirements of UBC § 3303(c).

§ 1706(d) of the UBC is deleted in its entirety. See 2 MCAR § 1.18806 C.

§ 1711(b) of the UBC is amended to read as follows:

UBC § 1711(b) Toilet Facilities. Each water closet stool shall be located in a clear space not less than 30 inches in width and have a clear space in front of the water closet of not less than 24 inches.

For provisions for the physically handicapped see 2 MCAR §§ 1.15501-1.15508.

§ 1711(c) of the UBC is deleted in its entirety.

§ 1711 of the UBC is amended by adding a new subsection (h) that reads as follows:

UBC § 1711(h) Sanitation Facilities. Sanitation facilities shall be provided for each Occupancy in accordance with Table 17-B and UBC §§ 605, 705, 805, 905, 1005 or 1205 as amended herein. Fixtures shall be provided for each sex in accordance with the percentage of occupants of each sex. When the percentage of each sex is not known, one-half for each sex shall be assumed. For sanitation facilities for the handicapped see 2 MCAR § 1.15503.

Types of building occupancy not shown, or when the provisions of Table 17-B are excessive due to a specific use or occupant load, facilities may be considered individually by the Administrative Authority.

§ 1716 of the UBC is amended to read as follows:

UBC § 1716. All unenclosed floor and roof openings, open and glazed

sides of landings and ramps, balconies or porches which are more than 30 inches above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail. Guardrails shall be not less than 42 inches in height. Open guardrail and stair railings shall have intermediate rails or an ornamental pattern such that a sphere 9 inches in diameter cannot pass through. The height of stair railings on open sides may be as specified in § 3305 (j) in lieu of providing a guardrail. Ramps shall, in addition, have handrails when required by § 3306.

On all earth sheltered structures a means shall be provided to restrict access to the roof area unless guardrails are provided and the roof is designed for vehicular loads.

EXCEPTIONS:

1. Guardrails need not be provided on the loading side of loading docks.

2. Guardrails for Group R, Division 3 and Group M, Division 1 Occupancies may be 36 inches in height.

3. Interior guardrails within individual dwelling units or guest rooms of Group R, Division 1 Occupancies may be 36 inches in height.

4. The open space between the intermediate rails or ornamental pattern of guardrails in areas of commercial and industrial type occupancies which are not accessible to the public may be increased such that a 12-inch-diameter sphere cannot pass through.

5. Guardrails on a balcony immediately in front of the first row of fixed seats and which are not at the end of an aisle may be 26 inches in height.

§ 1717(b) (1) (B) of the UBC is amended to read as follows:

UBC § 1717(b) (1) (B). On the room side surface of conforming walls or ceiling or other surfaces referred to in the first sentence of § 1717(b), provided the foam plastic is fully protected from the interior of the building by a thermal barrier of 1/2 inch gypsum wallboard or other approved material having an equivalent finish rating as determined by U.B.C. Standard No. 43-1. Thermal barriers shall be installed in a manner that they will remain in place for a minimum of 15 minutes under the same test conditions.

TABLE E

(7 SR 1211 2-21-83)

REQUIRED SANITATION FIXTURES BASED ON OCCUPANCY LOAD (1) (2)

OCCUPANCY	USE	S.F. per Occ.	WATER CLOSETS	URINALS	LAVATORIES	DRINKING FOUNTAINS	BATHTUBS OR SHOWERS	KITCHEN SINKS	SERVICE SINKS
Group A Occupancies	Auditoriums Bowling alleys Churches Conference Rooms Dance Floors Dining, Drinking Exhibit Rooms Gymnasiums Libraries Lodge Rooms Lounges Rinks Stadiums, Grandstands Theaters Waiting Rooms	30 30 60 80 30 30 80 30 100 80 80 30 80 30 80	Churches 1 for each 300 Men 1 for each 300 women Other Occupants Fixtures 1-100 1 101-200 2 201-400 3 Over 400 1 addt'nl each 500	Churches (3) (3)	Churches 1 for each 300 Other Occupants Fixtures 1-200 1 201-400 2 401-750 3 Over 750 1 addt'nl for each 500	1 for each 300	—	—	1
Group E Occupancies (6)	Elementary Secondary	85 130	Boys Girls 1/ea. 100 1/ea. 30 1/ea. 100 1/ea. 25	1/ea. 30	1 for each 100 1 for each 100	1 for each 75	—	—	1 per floor
Group I Occupancies	Prisons, Jails	100	1/ea. cell 1/ea. exercise room		1 in each cell 1 ea. exercise rm 1 for ea. 10 patients	1 for each 100	1 at each cell block floor	—	1 per floor
	Hospitals, Nursing Homes	100	1/ea. 8 patients 1/ea. waiting room Other 1/ea. 25 men 1/ea. 20 women	1/ea. 50	Other 1 for each 10	1 for each 100	1 for each 20 Other 1 for each 10		1 per floor

Group H Occupancies			Fact. Occ.	Wrhse. Fixt.	Fact. Occ.	Wrhse. Fixt.	Fact. Occ.	Wrhse. Fixt.	Factories Warehouses	
	Aircraft Hangars	500	1-10	1	(3)			for each		
	Factories	200	11-25	2			1-100	1-10(4)		
Group B	Municipal Buildings	80	26-50	3			Over 100	1-15(5)	1 for each 75	
Occupancies	Office Buildings	200	51-75	4						
	Sales	200	76-100	5						
	Service Stations	200	Over 100	1 addt'nl			Sales, Occ.	Offices Fixt.	Sales, Offices	1 per floor
	Storage Garages	500		for 30						
	Warehouses	500	Sales, Office, etc.		Sales, Office		1-15	1		
			Occ.	Fixt.	(3)		16-35	2	1 for each 150	
			1-15	1			36-60	3		
Group B-4			16-35	2			61-90	4		
Occupancies	Factories	200	36-55	3			91-125	5		
	Sales	200	56-80	4			Over 125	1 to 45		
	Warehouses	500	81-110	5						
			111-150	6						
Group R-1 Occupancies	Dwelling Units, Apt.	—	1		—		1		—	1	1	1 laundry tray for each 10 dwelling units or guest rooms
	Motel, Hotel Units	—	1 for each 10				1 for each 10			1 for each 10		
	Rooming Houses	200	1 for each 10				1 for each 10			1 for each 10		
	Dormitories	200	1 for each 10				1 for each 10			1 for each 10		
Group R-3 and R-4 Occupancies	1 and 2 Family	—	1		—		1		—	1	1	—
Group M Occupancies	—	—	—		—		—		—	—	—	—
TEMPORARY FACILITIES			1 for each 30		1 for each 30				1 for each 100			

*A—Area of building occupancy classification served
S.F.—per Occ.—from Column 3 of this table

Footnotes.

(1) Occupant load is computed using the equation. $\frac{A^*}{S.F.\ per\ Occ.}$ = Occupant Load

(2) Square feet per occupant is only for computing the occupant load to determine the plumbing fixtures required.

(3) Urinals may be furnished in place of water closets at the rate of one urinal for one water closet, but not to exceed one-third of the required water closets.

(4) 1 fixture for each 10 occupants.

(5) 1 fixture for each 15 occupants.

(6) For waterclosets, and lavatories, these numbers are *minimum* & equal number for each sex is required.

§ 1807(h) of the UBC is amended to read as follows:

UBC § 1807(h) Elevators. Elevators and elevator lobbies shall comply with the provisions of 2 MCAR §§ 1.18801-1.18806 and the following:

NOTE: A bank of elevators is a group of elevators or a single elevator controlled by a common operating system; that is, all those elevators which respond to a single call button constitute a bank of elevators. There is no limit on the number of cars which may be in a bank or group but there may be not more than four cars within a common hoistway.

1. Except for the main entrance level, all elevators on all floors shall open into elevator lobbies which are separated from the ramainder of the building as is required for corridor construction in § 3304 (g) and (h).

EXCEPTION: When a complete and approved automatic fire extinguishing system is installed in a Group B, Division 2, Occupancy, the separation of elevator or elevator lobbies shall not be required on any floor when such floor is provided with an exit corridor conforming to the provision of § 3304(g).

2. Each elevator lobby shall be provided with an approved smoke detector located on the lobby ceiling. When the detector is activated, elevator doors shall not open and all cars serving that lobby are to return to the main floor and be under manual control only. If the main floor detector or a transfer floor detector is activated, all cars serving the main floor or transfer floor shall return to a location approved by the fire department and building official and be under manual control only. The smoke detector is to operate before the optical density reaches 0.03 per foot. The detector may serve to close the lobby doors.

3. A permanent sign shall be installed in each elevator cab adjacent to the floor status indicator and at each elevator call station on each floor reading "IN FIRE EMERGENCY, DO NOT USE ELEVATOR–USE EXIT STAIRS", or similar verbage approved by the building official.

4. Elevator hoistways shall not be vented through an elevator machine room. Cable slots entering the machine room shall be sleeved beneath the machine room floor and extend to not less than 12 inches below the shaft vent to inhibit the passage of smoke into the machine room.

5. For car size requirements, see 2 MCAR § 1.18806 (b) (4).

§ 2303(a) of the UBC shall be amended to read as follows:

UBC § 2303. (a) General. All buildings and portions thereof shall be designed and constructed to sustain, within the stress limitations specified in this code, all dead loads and all other loads specified in this chapter or elsewhere in this code. Impact loads shall be considered in the design of any structure where impact loads occur.

EXCEPTION: Unless otherwise required by the building official, buildings or portions thereof, other than earth sheltered structures, which are constructed in accordance with the conventional framing requirements specified in Chapter 25 of this code shall be deemed to meet the requirements of this section.

§ 2305(d) of the UBC is amended to read as follows:

UBC § 2305(d) Snow Loads. Snow loads full or unbalanced shall be considered in place of loads set forth in Table No. 23-C, where such loading will result in larger members or connections.

A basic snow load of 40 pounds per square foot of horizontal projection is required in the following counties: Anoka, Carlton, Carver, Chisago, Cook, Dakota, Hennepin, Isanti, Lake, Pine, Ramsey, St. Louis, Scott and Washington. A basic snow load of 30 pounds per square foot of horizontal projection is required for all other counties.

Potential accumulation of snow at valleys, parapets, roof structures and offsets in roofs of uneven configuration shall be considered. Where snow loads occur, the snow loads shall be determined by the building official in accordance with Appendix "B".

EXCEPTIONS:

1. The requirements of Appendix "B" shall not apply to Group R Division 3, Group R Division 4 and M Occupancies.

2. A basic snow load of 30 pounds per square foot of horizontal projection shall be acceptable for detached Group M, Division 1 Occupancies in all counties.

Snow loads in excess of 20 pounds per square foot may be reduced for each degree of pitch over 20 degrees. See Appendix B, Section A.

§ 2311(g) of the UBC is amended to read:

UBC § 2311(g) Open Frame Towers. Radio towers and other towers of trussed construction shall be designed and constructed to withstand wind pressures specified in this Section, multiplied by the shape factors set forth in Table No. 23-H.

Wind pressures shall be applied to the total normal projected area of all the elements of one face (excluding ladders, conduits, lights, elevators, etc., which shall be accounted for separately by using the indicated factor for these individual members).

The effect of one-half inch of radial ice shall be included in the design of

open frame towers including all supporting guys. This effect shall include the weight of the ice and the increased profile of each such tower component so coated.

§ 2312(a) of the UBC is amended to read as follows:

UBC § 2312(a) General. For the purpose of the Code this State shall be considered to be in Zone "O", No Damage Area. Every building or structure and every portion thereof shall be designed and constructed to resist stresses produced by lateral forces as provided in this Section. Stresses shall be calculated as the effect of a force applied horizontally at each floor or roof level above the base. The Force shall be assumed to come from any horizontal direction.

Structural concepts other than set forth in this section may be approved by the Building Official when evidence is submitted showing the equivalent ductility and energy absorption are provided.

Where prescribed wind loads produce higher stresses, such loads shall be used in lieu of the loads resulting from earthquake forces.

§ 2403(e) is amended to read as follows:

UBC § 2403(e) Concrete Masonry Units. Concrete masonry units shall be of a quality at least equal to the requirements set forth in U.B.C. Standard No. 24-4 or No. 24-5 when used for bearing walls or piers or when in contact with ground or exposed to the weather; or equal to the requirements set forth in U.B.C. Standard No. 24-6 when used for nonbearing purposes and not exposed to the weather. Solid units subject to the action of weather or soil shall be Grade A. Concrete masonry units shall be tested as set forth in U.B.C. Standard No. 24-7.

Concrete masonry units used for walls below grade or for other uses as determined by the designer shall not be subject to the moisture control provisions of Table 24-4-A of UBC Standard 24-4.

§ 2417 is amended by the addition of paragraph (n):

UBC § 2417(n) Alternate Design Method. The specification for the Design and Construction of Load-Bearing Concrete Masonry 8th Printing May, 1978, published by the National Concrete Masonry Association may be used as an alternate design method providing the following conditions are satisfied.

1. The permit applicant must inform the building official, in writing, that the masonry design is based on the requirements of this subsection prior to granting of a building permit.

2. An outline of testing and field inspection schedules and design calculations signed by the responsible design professional shall be submitted to the building official prior to granting of a building permit.

3. Prior to occupancy, the permit applicant shall submit to the building official written evidence from a registered professional engineer certifying compliance with all requirements of this subsection.

§ 2501(a) of the UBC is amended to read:

UBC § 2501(a) Quality and Design. The quality and design of wood members and their fastenings shall conform to the provisions of this chapter, and to the applicable standards listed in Chapter 60 as amended herein.

§ 2510(h) of the UBC is amended to read as follows:

UBC § 2510(h) Metal Plate Connectors. Metal plate connectors employed as joint connectors in light wood trusses, and the design and testing of such trusses, shall conform to the Design Specification for Metal Plate Connected Wood Trusses, 1978 Edition published by the Truss Plate Institute Inc., TPI-78 and the following amendments, thereto:

§ 102(c) 5 of TPI-78 shall be amended to read as follows: Concentrated loads, and their points and method of application.

§ 310 of TPI-78 shall be added and reads: 310 Cross Grain Stress. Where design loads or their method of application induce cross-grain tension or bending stress, such cross-grain stress shall be considered in the design.

Snow loads shall be determined in accordance with the requirements of 2 MCAR § 1.10111 UBC § 2305(d). Wind loads shall be determined in accordance with the requirements of UBC § 2311.

Other loads shall be determined in accordance with the design requirements of UBC Chapter 23.

Each truss manufacturer shall retain an approved agency having no financial interest in the plant being inspected to make nonscheduled inspections of truss fabrication and delivery and operations.

The inspection shall cover all phases of truss operation including lumber storage, handling, cutting, fixtures, presses or rollers, fabrication, bundling and banding, handling and delivery.

§ 2907(a) of the UBC is amended to read as follows:

UBC § 2907(a) General. Footings and foundation, unless otherwise specifically provided, shall be constructed of masonry, concrete or treated wood in conformance with U.B.C. Standard No. 29-3 and in all cases shall extend below the frost line. Footings of concrete and masonry shall be of solid material. Foundations supporting wood shall extend at least 6 inches above the adjacent finish grade. Footings shall have a minimum depth below finished grade for the Zone as established below unless another depth is recommended by a foundation investigation.

1. In the absence of a determination by an engineer competent in soil mechanics, the minimum allowable footing depth in feet due to freezing shall be five feet in Zone I and three and one-half feet in Zone II.

Zone I—Shall include the counties of: Aitkin, Becker, Beltrami, Carlton, Cass, Clay, Clearwater, Cook, Crow Wing, Douglas, Grand, Hubbard, Itasca, Kanabec, Kittson, Koochiching, Lake, Lake of the Woods, Mahnomen, Marshall, Mille Lacs, Morrison, Norman, Otter Tail, Pennington, Pine, Polk, Red Lake, Roseau, St. Louis, Todd, Traverse, Wadena, Wilkin.

Zone II—Shall include the counties of: Anoka, Benton, Big Stone, Blue Earth, Brown, Carver, Chippewa, Chisago, Cottonwood, Dakota, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Hennepin, Houston, Isanti, Jackson, Kandiyohi, Lac Qui Parle, Le Sueur, Lincoln, Lyon, McLeod, Martin, Meeker, Mower, Murray, Nicollet, Nobles, Olmsted, Pipestone, Pope, Ramsey, Redwood, Renville, Rice, Rock, Scott, Sibley, Sherburne, Stearns, Steele, Stevens, Swift, Wabasha, Waseca, Washington, Watonwan, Winona, Wright, Yellow Medicine. Less depths may be permitted when supporting evidence is presented by an engineer competent in soil mechanics.

2. Soil Under Slab on Grade Construction for Buildings. When soil, natural or fill, is sand or pit run sand and gravel, and of depth in accordance with minimum footings depth requirements for each zone, slab on grade construction which supports roof and wall loads shall be permitted. Slab on grade construction for detached buildings Group M, Division 1 Occupancies may be placed on any soil except peat or muck.

UBC § 3203(d) 3 is amended to read as follows:

UBC § 3203(d) 3. Shingle; shake and tile roofs. A General. Installation shall be in accordance with Table No. 32-B. Underlayment, when required, shall be lapped horizontally and vertically so as to shed water.

In areas subject to roof ice build-up, underlayment consisting of two layers of Type 15 felt applied shingle fashion shall be installed and solid mopped together with approved cementing material between the plies extending from the eave up the roof to a point 24 inches inside the exterior wall line of the building.

The entire State of Minnesota shall be deemed an area subject to roof ice build-up.

EXCEPTIONS:

1. For wood shingle or wood shake roofs the underlayment shall extend 36 inches inside the exterior wall line of the building.

2. When interlocking tiles are used, the underlayment may consist of one layer of Type 40 or heavier asphalt-coated base sheet extending from the eave to a point 24 inches inside the exterior wall line of the building. When this

method is used, all horizontal and vertical seams of the base sheet shall be lapped 6 inches and be continuously sealed with approved cementing material and shall be applied only over solid sheathing.

§ 3205(c) is amended to read as follows:

UBC § 3205(c) Ventilation. Where determined necessary by the building official due to atmospheric or climatic conditions, enclosed attics and enclosed rafter spaces formed where ceilings are applied direct to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain and snow. The net free ventilating area shall be not less than 1/150 of the area of the space ventilated, except that the area may be 1/300, provided at least 50 percent of the required ventilating area is provided by ventilators located in the upper portion of the space to be ventilated at least 3 feet above eave or cornice vents with the balance of the required ventilation provided by eave or cornice vents.

§ 3207(c) of the UBC is amended to read as follows:

UBC § 3207(c). Where roof drains are required, overflow drains having the same size as roof drains shall be installed with the inlet flow line located 2 inches above the low point of the roof, or overflow scuppers having three times the size of the roof drains may be installed in adjacent parapet walls with the inlet flow line located 2 inches above the low point of the adjacent roof and having a minimum opening height of 4 inches. Overflow drains shall be connected to drain lines independent from the roof drains, and shall discharge above grade.

UBC § 3303(a) is amended to read as follows:

UBC § 3303. (a) General. This section shall apply to every exit door serving an area having an occupant load of more than 10, or serving hazardous rooms or areas, except that Subsections (c), (i) and (j) shall apply to all exit doors regardless of occupant load. Buildings or structures used for human occupancy and each dwelling unit or guest room leased for gain shall have at least one exit door that meets the requirements of Subsection (e).

UBC § 3304(h) is amended by adding an exception 2 to read as follows:

EXCEPTION:

2. In Type I and II-F.R. buildings housing Group B-2 Occupancies, corridor walls may be of approved wired glass set in metal frames. The glass height shall not exceed 2/3 of the width of the corridor. A draft curtain of at least one hour fire-resistive construction and not less than 24 inches in height shall be provided to protect the corridor from the Group B-2 Occupancy area (tenant space). The draft curtain shall be located above the glass and extend a minimum of 24 inches below any finished ceilings in the tenant space. If the finished ceiling is not a fire-rated assembly, the draft curtain shall extend

from the wire glass to a rated ceiling or floor assembly. When the B-2 Occupancy area (tenant space) is protected by an approved automatic fire-extinguishing system for a distance of twelve (12) feet in depth adjoining the corridor, and the corridor is not less than twelve (12) feet in width, glass other than wired glass may be approved. Open grille type gates and similar enclosing or security devices may be used in corridor walls of corridors not less than twelve feet in width, when the entire story is protected by an approved fire-extinguishing system.

In buildings of other than Type I or Type II-F.R. construction, this exception shall not be allowed, unless the entire building is provided with an approved automatic fire-extinguishing system.

UBC § 3305(j) exception 2 is amended to read as follows:

Exception 2—Private Stairway 30 inches or less in height may have handrails on one side only. Handrails are not required on private stairways with less than 3 risers.

UBC § 3319(b) is amended to read as follows:

(b) Minimum size of Exits. Every exit opening through which patients are transported on stretchers or beds shall be of sufficient width to permit the ready passage of such equipment but shall have a clear width of not less than 44 inches, except as hereinafter provided. Exit openings in Division 2 Occupancies shall have a clear width of not less than 34 inches. There shall be no projections within such clear widths.

UBC § 3319(c) is amended to read as follows:

Corridors. The minimum clear width of a corridor shall be 44 inches except as follows:

Corridors serving any area Group I, Division 1 Occupancies shall be not less than eight feet in width; corridors serving any Group I, Division 2 Occupancies shall be not less than six feet in width.

There shall be no change of elevation in a corridor serving non-ambulatory persons unless ramps are used.

In Group I, Division 3 Occupancies such as jails, prisons, reformatories and similar buildings with open barred cells forming corridor walls, the corridor and cell doors need not be fire resistive.

UBC Table 33A is amended as follows:

Delete the right hand column entitled "Egress by means of a ramp or elevator must be provided for the physically handicapped as indicated."

Also delete footnotes 2, 3, 4, 5, 6 and 8.

UBC § 3802 is amended by adding a section (e) as follows:

UBC § 3802(e) Special Automatic Fire Extinguishing Systems. In all occupancies having commercial cooking equipment (see NFPA No. 96-1976), automatic fire extinguishing systems complying with UBC Standard 38-1 or 38-2 shall be installed for protection of duct systems, grease removal devices, hoods and over commercial cooking equipment which may be a source of ignition (such as fat fryers, ranges, griddles, and boilers). Systems installed in accordance with the following standards are also permitted:

1. Standards for foam-water sprinkler systems and foam-spray systems, NFPA No. 16-1974.

2. Standard for dry-chemical extinguishing system, NFPA No. 17-1975.

EXCEPTION: These requirements shall not apply to Group R-3 and Group R-4 occupancies.

§ 3803(a) of the UBC is amended as follows:

UBC § 3803(a) General. Standpipes shall comply with the requirements of this section and in accordance with UBC Standard 38-3, amended as follows:

UBC Standard 38-3 § 38.306(a) Assured Source Required. Class I, Class II and Class III standpipe systems shall be provided with an approved source of water supply. With prior approval of the Fire Chief, Class I standpipes systems may be supplied only through a fire department connection.

UBC Table 38A is amended as follows:

Section 2, occupancy column, shall read: Occupancies 3 stories or more but less than 150 feet in height, except Group R, Division 3 or 4. Class II standpipes are not required in Group E or Group R-1 occupancies.

UBC § 4701(a) is amended to read as follows:

UBC § 4701(a) General. The installation of lath, plaster and gypsum board shall be done in a manner and with materials as specified in this Chapter, or as set forth in ANSI A42.2, 1971 Specifications for Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior and ANSI A42.3, 1971 Specifications for Lathing and Furring for Portland Cement and Portland Cement-Lime Plastering, Exterior (Stucco) and Interior; and, when required for fire-resistive construction, also shall conform with the provisions of UBC Chapter 43.

Other approved wall or ceiling coverings may be installed in accordance with the recommendations of the manufacturer and the conditions of approval.

UBC §§ 5001 through 5006 are amended to read as follows:

UBC §§ 5001 through 5006 are deleted and replaced by 2 MCAR §§ 1.10301-1.10336.

UBC §§ 5101 through 5104 are amended to read as follows:

UBC §§ 5101, 5102, 5103 and 5104, Elevators, Dumbwaiters, Escalators, Manlifts, Moving Walks, Hoists and Lifts are deleted. Refer to 2 MCAR §§ 1.18801-1.18806.

§ 6001 of the UBC is amended as follows:

UBC § 6001. The UBC Standards which are referred to in various parts of this code shall be the Uniform Building Code Standards, 1979 Edition, and are hereby declared to be a part of this code with the following amendment.

UBC § 6001, Chapter 25, 25-17 is amended to read as follows:

Chapter 25, 25-17, 2510(a), 2510(b), 2510(c), 2510(d), 2510(e), 2510(h), 2514(b)1, 2514(b)2, Tables Nos. 25-F, 25-G, 25-H and 47-H Timber Connector Joints, Bolted Joints, Drift Bolts and Wood Screws, Lag Screws. National Design Specification for Wood Construction (1977), National Forest Products Association. Metal Plate Connected Wood Trusses TPI-78, Truss Plate Institute. Nails and Staples, Federal Specification No. FF-N-105B (March 17, 1971).

insert new AR0242 3J

§ 1.10112 Validity Clause. If any section, subsection, sentence, clause, or phrase of this Code, is for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portions of this Code.

It is hereby declared that the Department of Administration would have adopted this Code and each section, subsection, clause or phrase thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses and phrases be declared unconstitutional.

§§ 1.10113 to 1.10299 Reserved for future use.

Minnesota Prefabricated Structures and Manufactured Buildings Code

§ 1.10301 TITLE AND SCOPE. Identification and title. §§ 1.10301 through 1.10336 shall be known as the Minnesota Prefabricated Structures and Manufactured Buildings Code. Unless otherwise specified, subsequent reference in these chapters to "the Code" shall mean the "Minnesota Prefabricated Structures and Manufactured Buildings Code".

§ 1.10302 Purpose. The purpose of these rules is to govern the construction of, and provide certification for, prefabricated structures and manufactured buildings and components.

§ 1.10303 Definitions. Unless otherwise expressly stated, the following terms shall, for the purpose of this Code, have the meaning indicated in this section. The definitions promulgated by the Model Code Standardization Council shall apply to terms included within this Code but which are not herein defined.

A. APPROVED is approved by the State Building Inspector.

B. CODE is the Minnesota State Building Code.

C. COMMISSIONER is the Commissioner of Administration.

D. CLOSED CONSTRUCTION is any building component, assembly or system manufactured in such a manner that all portions cannot be readily inspected at the installation site without disassembly, damage to, or destruction thereof.

E. OPEN CONSTRUCTION is any building, component, assembly or system manufactured in such a manner that all portions can be readily inspected at the installation site without disassembly, damage to, or destruction thereof.

F. MANUFACTURED BUILDING means any building which is of closed construction and which is made or assembled in manufacturing facilities, on or off the building site, for installation, or assembly and installation, on the building site. Manufactured building may also mean, at the option of the manufacturer, any building of open construction, made or assembled in manufacturing facilities away from the building site, for installation, or assembly and installation, on the building site.

G. BUILDING COMPONENT is any sub-system, sub-assembly, or other system designed for use in, or as a part of, a structure, including but not limited to: structural, electrical, mechanical, fire protection, and plumbing systems, and other systems affecting health and safety.

H. BUILDING SYSTEM is plans, specifications and documentation for a

system of manufactured building or for a type or a system of building components, including but not limited to, structural, electrical, mechanical, fire protection and plumbing systems, and including such variations thereof as are specifically permitted by regulation, and which variations are submitted as part of the building system or amendment thereof.

I. CODE COMPLIANCE CERTIFICATE is the certificate provided by the manufacturer to the State Building Inspector which warrants that the manufactured building or building component complies with the Code.

J. COMPLIANCE ASSURANCE PROGRAM means the system documentation and methods of assuring that manufactured buildings and building components, including their manufacture, storage, transportation, assembly, handling and installation, conform with these rules and regulations.

K. EVALUATION AGENCY is an approved person or organization, private or public, determined by the State Building Inspector to be qualified by reason of facilities, personnel, experience and demonstrated reliability and independence of judgment, to investigate, evaluate and approve manufactured buildings or building components, building systems, or compliance assurance programs.

L. INDEPENDENCE OF JUDGMENT means not being affiliated with or influenced or controlled by building manufacturers or producers, suppliers, or vendors of products or equipment used in manufactured buildings and building components in any manner which is likely to affect their capacity to render reports and findings objectively and without bias.

M. INSPECTION AGENCY is an approved person or organization, private or public, determined by the State Building Inspector to be qualified by reason of facilities, personnel, experience and demonstrated reliability and independence of judgment, to conduct or supervise compliance assurance programs relating to the manufacture, handling, storage, and transportation of manufactured buildings or building components, and attach labels evidencing compliance with the Code.

N. INSTALLATION is the process of affixing or assembling and affixing, manufactured buildings or building components on the building site, or to an existing building.

O. LABEL is an approved device affixed to a manufactured building or building component, by an approved agency, evidencing code compliance.

P. LOCAL ENFORCEMENT AGENCY is an agency of a municipality which enforces the Code.

Q. QUALITY CONTROL PROGRAM as used herein shall be synonymous with compliance assurance program.

R. SEAL is a device or insignia issued to the Manufacturer by the State Building Inspector evidencing compliance with the Code.

§ 1.10304 Approval.

A. The State Building Inspector reserves to himself the responsibility for approving manufactured buildings, building systems and components for compliance with the Code. Such responsibility may be delegated by him to approved evaluation agencies.

B. Bi-annual approval renewal. Manufacturers shall submit plans bi-annually for re-evaluation and approval.

C. Approval expiration. Approvals shall expire when there are revisions to the Code under which the approval was granted. At such time the manufacturer shall:

1. Submit entire new documentation for evaluation and approval or;

2. Submit evidence that the plans as approved are in compliance with the Code as revised.

§ 1.10305 Inspection. The State Building Inspector reserves to himself the responsibility for inspecting manufactured buildings and building components for compliance with the Code. Such responsibility may be delegated by him to approved inspection agencies or approved local enforcement agencies.

§ 1.10306 Certification. Manufactured buildings and building components which are sold, offered for sale or installed in the state shall bear a seal evidencing the State Building Inspector's certification of code compliance. Such certification shall be conclusive on all agencies, instrumentalities, and municipalities of the state.

§ 1.10307 Reciprocity. Upon a showing that another state provides for certification of manufactured buildings and components upon compliance with standards that are at least equal to those provided in the Code, the Commissioner may provide that such certification granted by such state have the same force and effect as certification by the State Building Inspector. The Commissioner may make such reciprocity contingent upon such other state granting reciprocal effect to certification by the State Building Inspector.

Pursuant to the provisions of 2 MCAR § 1.10307 the Commissioner has established reciprocity with the following states which have granted reciprocity to the State of Minnesota:

A. State of Indiana.

§ 1.10308 Modification. Manufactured buildings or components bearing a state seal shall not in any way be modified unless a written request is made and written approval obtained from the State Building Inspector or municipal building official.

§ 1.10309 Testing. The State Building Inspector or the evaluation agency

may require that specific components, systems, etc. be tested. Tests shall be performed by an approved testing agency. Such tests and procedures shall be reviewed by the evaluation agency or the State Building Inspector.

§ 1.10310 Inspection. GENERAL. The State Building Inspector shall make, or cause to be made, such inspections of the entire process of manufacturing, certifying, handling, storing and transporting of manufactured buildings and building components produced pursuant to approved building systems as he deems necessary.

A. MANUFACTURING FACILITIES. As part of the approval process of evaluating building systems and compliance assurance programs, the State Building Inspector or an evaluation agency shall inspect the manufacturing facilities in which the buildings or building components are to be manufactured.

B. PRODUCTION PROCESS. The State Building Inspector or an inspection agency, shall make such inspections as may be required by an approved compliance assurance program, or as may be deemed necessary by the State Building Inspector.

C. DAMAGED BUILDINGS OR COMPONENTS. Prior to the issuance of a building permit, the State Building Inspector or an inspection agency shall inspect, or cause to be inspected, certified manufactured buildings or building components which it determines to have been sufficiently damaged after certification to warrant such inspection and take such action with regard to such buildings or building components as is authorized under 2 MCAR § 1.10319, or as is otherwise necessary to eliminate dangerous conditions.

The State Building Inspector shall require manufactured buildings or building components which are so damaged as no longer to comply with the Act and these rules and regulations to be brought into compliance promptly. If such buildings or building components are not brought into compliance with the Act and these rules and regulations within a reasonable time, or if they are so damaged that they cannot be brought into compliance, the State Building Inspector shall order that the labels be removed from such buildings or building components. Irreparably damaged buildings or building components shall be disposed of in accordance with applicable law.

D. INSPECTION AGENCY REVIEW. The State Building Inspector shall have the right to examine each approved inspection agency, at any reasonable time, and without prior announcement, in order to monitor the reliability of each agency and of its monitoring of each compliance assurance program. Each such examination shall investigate the adequacy of all procedures used by the agency in monitoring compliance assurance programs including inspection, tests, production methods, process controls, operator performance, materials receipt, storage and handling, workmanship standards, records and all other activities which implement the compliance assurance program in the manufacturing facility, during transport, on-site, and at critical subcontractors' facilities. The results of such examinations shall be kept on file at the

offices of the State Building Inspector. Copies of such reports shall be sent to the inspection agency. Inspection agencies shall be specifically notified of any deficiencies and of the manner in and time by which such deficiencies must be eliminated. If deemed necessary by the State Building Inspector, an agency's approval may be suspended or revoked as provided in 2 MCAR § 1.10334. Such inspections shall take place at the manufacturing facility, and may also take place at the inspection agencies office, or at the site of installation.

E. EVALUATION AGENCY REVIEW. The State Building Inspector shall have the right to examine each approved evaluation agency, at any reasonable time, and without prior announcement, in order to monitor the reliability of each agency. Each such examination shall investigate the adequacy of all evaluative procedures including engineering evaluation of plans, specifications and test results, testing, and analysis of compliance assurance programs. The results of such examination shall be kept on file at the offices of the State Building Inspector. Copies of such reports shall be sent to the evaluation agency. Agencies shall be specifically notified of any deficiencies and of the manner in time by which such deficiencies must be eliminated. If deemed necessary by the State Building Inspector, approval of an evaluation agency may be suspended or revoked as provided in 2 MCAR § 1.10334.

§ 1.10311 On-Site inspection by local enforcement agency. Local enforcement agencies are authorized to inspect the installation of manufactured buildings, components and systems, and are responsible for determining that such installation is completed in accordance with its certification. The local enforcement agency may inspect, to the maximum extent possible without causing undue delay, manufactured buildings, components or systems at the installation site for compliance with the Code. Such inspection shall not require the removal of permanent parts of the structure. Evidence of noncompliance with the certification shall be reported to the State Building Inspector.

§ 1.10312 Local zoning. Local land use zone requirements, building setback, side and rear yard requirements, site development and property line requirements are specifically and entirely reserved to local municipalities.

§ 1.10313 Standards and requirements. The standards and requirements for manufacture and installation of manufactured buildings, systems and components shall be the current State Building Code.

§ 1.10314 Building permits.

A. An application for a building permit to a local building official for the installation of manufactured buildings or systems pursuant to this Code shall, in addition to any other requirements, contain:

1. A statement that such application is made for permission to install manufactured buildings or systems in accordance with the provisions of the Code signed by the applicant or his agent with the appropriate address.

2. A copy of the site and building plans and specifications and evidence of plan approval by the State Building Inspector or evaluation agency.

3. The information required on the data plate (2 MCAR § 1.10325).

B. The local building official shall issue a permit, license, certificate, authorization, or other required document as the case may be for the installation of the manufactured building or system if the application is compiled in accordance with this Code. The manufacturer shall submit evidence to assure that the design loads are in accordance with the appropriate provisions of the Code. Foundation plans, all utility installations and connections and all provisions of 2 MCAR § 1.10312 are subject to local approval.

§ 1.10315 Certificate of occupancy. Upon completion of the installation of any manufactured building or system the owner, manufacturer, builder, architect, lessee, tenant of their agent or other interested person shall be entitled, upon showing of compliance with the Code, to demand and obtain, upon proper payment being made thereof in appropriate cases, any permit, license, certificate, authorization or other required document, the issuance of which is authorized pursuant to any state or local building regulation.

§ 1.10316 Changes to approved plans. Where the manufacturer proposes or is required to change the approval plans or installation instructions such request shall be in writing and work shall not commence until such written approval is received. Such changes shall be incorporated in the inspection procedures manual.

§ 1.10317 Change of ownership, name or address. In the event of a change in the ownership, name or office address of any manufacturer, the manufacturer shall notify the State Building Inspector, the evaluation agency, or the local enforcement agency in writing within ten (10) days. If the manufacturer changes or adds to the location of the manufacturing facility, he shall so notify the State Building Inspector, the evaluation agency, or the local enforcement agency at least thirty (30) days prior to the start of manufacture at such new location.

§ 1.10318 Change in the Code. The State Building Inspector shall notify the manufacturer, the evaluation agency, or the local enforcement agency of amendments to the Code, and shall allow the manufacturer a reasonable time in which to submit a request for change in plan approval, if required to conform.

§ 1.10319 Non-compliance. Non-compliance with the provisions of the Code or unauthorized deviation from the approved plans or production shall be cause for revocation of the plan approval and seals.

§ 1.10320 Seals.

A. R-3 and R-4 Occupancies. Each manufactured building manufactured pursuant to the Code shall have permanently attached thereto in a location

shown on the approved plans, a state seal evidencing the State Building Inspector's approval of such building. When a manufactured building consists of one or more sections, that may be transported or stored individually each section must be marked or labeled to indicate that the section is a part of a manufactured structure and shall bear the number of the State of Minnesota Seal assigned to the building.

The marking or label shall also indicate the name of the manufacturer, the address of the manufacturing facility and the manufacturers serial number or other designator assigned to the building. All labels shall be visible from the exterior, shall be legible and shall remain on the structure until the building is complete.

B. All other occupancies. One seal is required per transportable unit.

§ 1.10321 Issuance. A seal shall be issued by the State Building Inspector to the manufacturer upon application and after plan approval has been issued, and shall be issued in accordance with the following:

A. If the State Building Inspector delegates the issuance of seals to an evaluation or inspection agency, the agency shall be required to obtain approval from the State Building Inspector for the manner in which they are handled;

B. Seals must be serially numbered;

C. A manufacturer's compliance assurance program, submitted in accordance with 2 MCAR § 1.10332 A. shall include requirements for issuance, possession of, attachment of and accounting for all seals to assure that seals are attached only to buildings or building components manufactured pursuant to an approved building system and inspected pursuant to an approved compliance assurance program;

D. If the State Building Inspector or an inspection agency determines that the manufacturer's record of compliance is such that the State Building Inspector or inspection agency need not maintain an inspector in a given plant at all times, the State Building Inspector or inspection agency may entrust seals to the custody of one or more employees of the manufacturer, who shall be charged with controlling the use of such seals. Such employees shall not be given custody of more seals than are necessary to accommodate the manufacturer's anticipated production for one month. If the conditions of custody are violated, the State Building Inspector or an inspection agency shall immediately regain possession of all seals that have not been applied to the manufactured buildings or building components and shall take such further action with respect to buildings or components already sealed, and with respect to future seals, as it may deem necessary to assure compliance with the Act and these rules and regulations.

§ 1.10322 Reporting.

A. Approved inspection agencies shall maintain a record of inspections and

such records shall be made available to the State Building Inspector annually or upon request.

B. Manufacturers shall report monthly the disposition of seals. Such report shall identify, by manufacturer's serial number, the manufactured building or component to which such seal was affixed.

§ 1.10323 Return of seals. The manufacturer shall return all seals allocated for a manufactured building or system to the State Building Inspector where the manufacturer, for any reason, determines that such seals shall no longer be needed.

§ 1.10324 Revocation. Upon revocation of plan approval, all seals not affixed to a manufactured building or system shall be returned. All seals which have been affixed after the date of revocation shall be void.

§ 1.10325 Manufacturer's data plate. The data plate form furnished by the State Building Inspector shall contain but not be limited to the following information, and shall be placed by the manufacturer in the vicinity of the electrical distribution panel or in some other approved designated location that is readily accessible for inspection:

A. Manufacturer's name and address.

B. Serial number of the unit.

C. Model designation and name of manufacturer of major factory-installed appliances.

D. Where applicable, identification of permissible type of gas for appliances and directions for water and drain connections.

E. Name and date of standards complied with.

F. Seal serial number.

G. Design loads.

H. Special conditions or limitations of the unit.

I. Date of manufacture.

J. Electrical ratings-instructions and warnings on voltage, phase, size and connections of units and grounding requirements.

§ 1.10326 Plan approval procedures. A plan approval shall be obtained from the State Building Inspector or the evaluation agency for manufactured buildings and systems. Such approvals are mandatory for all closed construction. Approval for open construction is optional to the manufacturer. General requirements:

A. Applications, plans, specifications and other documentation shall be submitted in sufficient copies as required. Plan size shall not exceed 18" by 24".

B. Applications shall be made in letter form.

C. All documentations and plans shall indicate the manufacturer's name, office address and address of manufacturing facility.

D. A quality control manual prepared by the manufacturer shall be submitted.

1. Where the manufacturer elects to have each building or system produced individually inspected, a quality control manual need not be submitted.

E. Manufacturers shall submit plans showing all elements relating to specific systems on sheet(s) properly identifiable.

F. Each plan shall bear the signature and seal of an approved registered architect or professional engineer where required.

G. The plan shall indicate the method of evaluation and inspection for all required on-site testing of the systems.

H. Plans shall designate all work to be performed on site, including connections of all systems, equipment and appliances and all work performed in the plant.

I. A 3" x 4" clear rectangular space shall be provided on all sheets of plans near the title box for the stamp of approval.

J. The design of plumbing, electrical, heating and mechanical systems or any structural design or method of construction and data shall be in accordance with the State Building Code.

K. Grade, quality and identification of all materials shall be specified.

L. Design calculations and test reports shall be submitted when required.

M. Plans shall be drawn to scale.

N. Plans shall indicate the location of the approved seal and data plate.

§ 1.10327 Products manufactured in more than one location. If the manufacturer produces the same products at more than one manufacturing facility, the manufacturer shall provide such additional copies of documentation as may be required.

§ 1.10328 Non-conforming application and plans. In the event that the application is determined to be unsuitable for processing prior to plan check, the

applicant shall be notified in writing of such unsuitability and the basis thereof within thirty (30) days of the date the application is received by the State Building Inspector or evaluation agency.

§ 1.10329 Evidence of plan approval. Plan approvals shall be evidenced by the stamp of approval of the State Building Inspector or evaluation agency. One copy of all approved documentation shall be returned to the manufacturer.

§ 1.10330 Required construction details. Plans shall provide or show, but not be limited to, the following details:

A. General.

1. Details and method of installation of manufactured buildings or components to foundations or to each other.

2. All exterior elevations.

3. Cross sections as necessary to identify major building components.

4. Details of flashing, such as at openings and at penetrations through roofs. Indicate flashing material and gauge to be used.

5. Attic access and attic ventilation.

6. Exterior wall, roof and soffit material as well as finish.

7. Interior wall and ceiling finish material.

8. Fire separation details.

9. Sizes, locations and types of doors and windows.

10. Recommended foundation plans, vents and underfloor access.

11. Evidence of compliance with the Design and Evaluation Criteria for Energy Conservation in New Buildings, Additions, Remodeled Elements of Buildings, and Standards for Certain Existing Public Buildings, 1978 Edition 2 MCAR §§ 1.16001 through 1.16006.

B. Plumbing detail requirements.

1. Plan or schematic drawing of the plumbing layout including, but not limited to, size of piping, fittings, traps and vents, cleanouts and valves, gas, water and drainage systems.

2. Plumbing materials, fixed appliances and equipment to be used. Indicate make, model, rating/capacity.

3. Make and model of safety controls and their location, such as for water heaters.

4. How piping is to be supported and intervals of support.

5. Location of vents above roofs and required clearances including, but not limited to, clearances from air intakes, other vents and flues.

6. Indicate method(s) of testing.

C. Structural.

1. Engineer's calculations of structural members.

2. Allowable soil bearing value and ground water table.

3. Structural and framing details of all floors, roofs and walls.

4. Details of roof trusses and stress diagrams.

5. Details of reinforcing steel.

6. Complete loading schedule.

7. Column loads and column schedule.

8. Lintel schedule.

9. Size, spacing and details of all structural elements.

10. Grade or quality of all structural elements (lumber, steel, concrete).

11. Elevations of structural elements, walls or sections thereof providing resistance to vertical loads or lateral forces.

12. Complete details of all structural connections including, but not limited to, chord splices, corner and wall intersection details, post and beam connections, beam splices and column splices. Both in-plant and on-site connections shall be shown.

D. Space and fire safety.

1. Detail of time period of fire resistance for all stairways, doors, walls, floors, ceilings, partitions, columns, roof and shaft enclosures.

2. Detail as to width of all aisles, corridors, passageways and stairway enclosures.

E. Building classification.

1. Occupancy or use.

2. Area, height, and number of stories.

3. Type of construction.

4. Fire hazard designation.

F. Mechanical detail requirements.

1. Location of all equipment and appliances. Indicate equipment listed or labeled by approved agencies.

2. Heat loss calculations.

3. Manufacturer's name, make, model number, BTU, input rating of all equipment.

4. Duct and register locations, size, materials.

5. Clearances from combustible material or surfaces for all ducts, flues, and chimneys.

6. Method of providing required combustion air and return air.

7. Location of flues, vents and chimneys and clearances from air intakes, and other vents and flues.

8. Details regarding dampers in ducts penetrating fire separations.

9. Indicate method(s) of testing.

10. Complete drawings of fire sprinkler systems, standpipe system or fire alarm system, if required.

11. Fuel supply and storage details.

G. Electrical detail requirements.

1. Plan of service equipment, including service entrance, conductors, service raceway and clearances above ground and above structures.

2. Method and detail for grounding service equipment.

3. A single line diagram of the entire electrical installation.

4. Load calculations for service and feeders.

5. Sizes of all feeders and branch circuits.

6. Size, rating and location of main disconnect/overcurrent protective devices.

7. Method of interconnection between manufactured buildings or components and location of connections.

8. Location of all outlets and junction boxes.

9. Method of mounting fixtures and wiring installation.

§ 1.10331 General. This section outlines the requirements for a comprehensive program of quality control. It shall be the manufacturer's responsibility to execute every aspect of this program. The manufacturer shall continue to be responsible for all corrective actions required, and the contractual relationship with an approved inspection agency shall not diminish such responsibility.

§ 1.10332 Requirements for manufacturer.

A. Provide a quality control manual with index including but not limited to the following:

1. Procedure for periodic revision and resubmittal to the State Building Inspector or the evaluation agency.

2. Organizational structure for implementing and maintaining the quality control program and the functional relationship with other elements of the organizational structure.

3. A uniform system of audit (in-depth analysis of quality control program effectiveness and means to identify deficiencies) to periodically monitor program performance.

4. The means of identification and segregation to prevent unauthorized use and disposition of items that do not conform to drawings or specification requirements.

5. Procedures for timely remedial and preventive action for all problems that affect product quality.

6. Sampling inspection where feasible.

7. Use and maintenance of appropriate inspection and test equipment to assure conformance to drawings and specifications.

8. A system to indicate inspection stations during manufacturing and site operations.

9. Inspection and test procedures including accept/reject criteria.

10. The maintenance of adequate records of inspections and tests performed during manufacturing and site operations and assurance that such records are complete and reliable. Copies of forms to be utilized shall be included.

11. A system to control changes in production or inspection procedures.

12. Procedures to assure effective control over procurement sources to ensure that materials, supplies and other items used in production and site operations conform to applicable drawings, specifications and quality requirements.

13. Procedures for inspection of materials, supplies and other items at the point of receipt.

14. Implementation of inspection and test procedure to control the quality of in-process fabrication and workmanship.

15. Procedures for final inspection on all manufactured buildings or systems before shipment to the site or storage point including identification and seal application.

16. Procedures for packing, packaging and shipping operations and related inspection.

17. Procedures for handling and storing all finished manufactured buildings or components.

18. Installation procedures with appropriate inspection procedures. Utility hook-up procedures shall contain appropriate inspection criteria and test description.

B. Identify the inspection agency.

C. Identify the manufacturer's representative who will be assigned the responsibility for implementing the quality control program. Define his functional obligation, responsibility and authority. The State Building Inspector or the evaluation agency shall be advised of any subsequent change.

D. The manufacturer or his agent shall be responsible for timely and effective performance of service and repairs related to code compliance.

§ 1.10333 Inspection agencies' procedures for compliance assurance. The inspection agency shall monitor the manufacturer's approved quality control program and inspect the manufactured building or system to assure compliance with the approved plans and specifications and the quality control manual.

§ 1.10334 Approval of inspection and evaluation agencies.

A. Requirements for submission. An inspection or evaluation agency seeking approval shall submit an application to the State Building Inspector which shall include the items listed in this Section.

1. The original Articles of Incorporation of the agency and all subsequent amendments thereto, as filed in the State of incorporation.

2. The bylaws of the organization, if any.

3. The names, addresses and business affiliations of all members of the Board of Directors and of top management personnel.

4. Stock owned in amounts over $5,000 reflecting the financial interests of the agency's Board of Directors and top management personnel.

5. Certification by the agency that:

a. Its board of directors, as a body, and its technical personnel, as individuals, can exercise independence of judgment; and

b. Its activities pursuant hereto will result in no financial benefit to the agency via stock ownership, or other financial interests in any producer, supplier or vendor of products involved, other than through standard published fees for services rendered.

6. Names, years of experience, State in which professionally registered and other qualifications of the directors of inspection or evaluation programs.

7. Names and years of experience of employees practicing in the following disciplines: architecture, structural engineering, mechanical engineering, electrical engineering, fire protection and other branches of engineering; the States in which each is registered and the services each performs.

8. An organization chart showing management and supervisory persons including the number of graduate engineers and architects, and the names of all consulting engineers or architects, designating which are full-time and which are part-time engineers.

9. Number and location of factory inspectors, supervisors, and other technicians, including evaluators of factory inspectors and the qualifications of each specialized group, including records of work experience, licenses held and other pertinent qualifications; descriptions of the type of work each group and each technician is expected to perform, and the qualifications of each group and each technician to perform the work assigned.

10. An outline of the training program, if any, of the agency to assure that all inspectors, evaluators and other technicians are properly trained to do each job assigned to them.

11. An outline of the general procedures for supervision of inspectors and evaluators, including checking and evaluation of their work.

12. All engineers, technicians and other personnel who will perform services for the organization but who are not employees of the organization, and the supervisory and other relationships which each will have to the agency.

13. Type of products, components, equipment, structures and other

items which the organization has evaluated, tested, or inspected, and the number of years of experience the organization has had with each, and the type of codes, standards, specifications and requirements with respect to which the organization has had experience in providing evaluation, inspection or testing services, and the number of years of experience with each.

14. Description of the record-keeping system the agency proposes to use with particular regard to availability of records to the State Building Inspector and the capacity to render reports to the State Building Inspector.

15. Description of the frequency with which the agency is capable of performing inspections or evaluations.

16. List of States in which the agency is now approved to inspect or evaluate manufactured buildings or building components, and a further listing of those States in which the agency intends to seek such approval within the next two (2) years.

17. Certification that the agency is able to evaluate building systems for compliance with the codes, standards, specifications and requirements adopted herein, or manufactured buildings or building components for compliance with approved building systems.

18. Fee as required by 2 MCAR § 1.10335.

B. Procedures for approving and delegating.

1. The State Building Inspector shall approve inspection or evaluation agencies which meet the requirements of Section 1 of this Part and which the State Building Inspector finds otherwise qualified to perform the functions proposed to be delegated to them.

2. Prior to a full evaluation of an application for approval, the State Building Inspector shall determine whether such application is complete and in accordance with § 1.10334. In the event the application is found to be unsuitable for processing, the applicant shall be notified in writing of such unsuitability and the basis thereof within thirty (30) days of the date the application is received by the State Building Inspector. In such event, all but $25.00 of the fee will be returned, and the findings of unsuitability shall be without prejudice. Any subsequent submission shall be treated as a new application.

3. In the event an inspection or evaluation agency is not approved, the State Building Inspector shall return one complete application to the applicant with a written explanation of the reasons for such disapproval attached thereto.

4. Approval of inspection or evaluation agencies shall be evidenced by a letter to the applicant indicating such approval and stating specifically the functions which the applicant has been approved to perform. Such approval shall not constitute the actual delegation of such functions.

C. Suspension and revocation.

1. Grounds. The State Building Inspector may suspend or revoke its approval of any evaluation agency or inspection agency if the approval was issued in error, was issued on the basis of incorrect information, or was issued in violation of the Act or these rules and regulations, or if the agency violates the Act or these rules and regulations, if examination pursuant to 2 MCAR § 1.10310 4. (D) and (E) disclose that the agency has failed to perform properly, or for such other cause as may be deemed sufficient by the State Building Inspector to warrant such action. Appeals from suspensions or revocations shall receive timely review.

2. Procedures in event or revocation.

a. General. If the State Building Inspector suspends or revokes the approval of an evaluation or inspection agency, the evaluation or inspection agency shall be given notice in writing of the suspension or revocation with the reasons therefor set forth therein. Manufacturers being evaluated or inspected by such agencies, and all local enforcement agencies within this State shall also be notified in writing of such suspensions or revocations. Such notices shall contain instructions to the local enforcement agencies as to manufactured buildings or building components previously certified by an agency whose approval has been suspended or revoked.

b. Records. An evaluation or inspection agency whose approval has been suspended or revoked shall within ninety (90) days of the suspension or revocation deliver to the custody of the State Building Inspector the originals of all records required by these rules and regulations to be made of, or in the course of, the agency's operations pursuant to the Act and these rules and regulations.

c. Seals. An evaluation or inspection agency for which approval has been suspended or revoked shall, within ninety (90) days of the suspension or revocation, deliver to the custody of the State Building Inspector all seals in the agency's possession, under its control, or for which it is responsible pursuant to these rules and regulations.

§ 1.10335 Fees. General. All fees shall be:

A. In the form of checks or money orders.

B. Payable to: Minnesota State Treasurer.

C. Addressed to: State of Minnesota
Department of Administration
Building Code Division
No. 408 Metro Square Building
7th and Robert Streets
St. Paul, Minnesota 55101

D. Seal Fee, twenty dollars ($20.00) per Seal. Replacement seal fee for damaged or lost seals, five dollars ($5.00) per Seal.

E. For all other work performed by the Building Code Division such as, but not limited to: the review of plans, specifications, and independent agency reports, inspection and quality control evaluation, a fee of twenty dollars ($20.00) per man hour shall be charged.

F. Travel expense shall be charged at the rates established for state employees by the Commissioner of Administration.

G. Inspection and/or evaluation agencies.

1. Initial fee of $150.00 shall be submitted with the application for agency approval. The initial fee shall be submitted prior to January 1, 1981 by all currently approved agencies and shall include any additional data necessary to show compliance with 2 MCAR §§ 1.10310, 1.10321, 1.10334.

2. A registration fee of $75.00 is required annually, due January 1 of each year, to maintain State approval.

§ 1.10336 Provisional authority. A manufacturer who files an application in proper form for quality control approval shall have temporary authority to acquire seals commencing twenty days after the date of filing of the application, unless within such period the Commissioner, by written notice mailed to the manufacturer at the address shown on his application or served upon him personally, shall deny temporary authority and state his reasons for doing so. Such temporary authority shall continue until final determination of the manufacturer's application for quality control approval, or revocation pursuant to 2 MCAR § 1.10319, whichever shall first occur, and shall empower the manufacturer to affix seals to all models whose plans have been approved and which comply with the Code. A manufacturer operating under temporary authority is subject to all verification inspections and other requirements imposed upon a manufacturer who has obtained quality control approval.

§§ 1.10337 through 1.15499 Reserved for future use.

State Building Code Chapter 55
Facilities for the Handicapped

§ 1.15501 Where required.

A. General. In addition to other provisions in this Code, facilities for the handicapped shall be provided in accordance with this chapter. See UBC Chapter 17 for additional requirements.

B. Scope. Provisions of this chapter shall apply to all buildings except the following:

1. Group R-3, Group R Division 4 and M Occupancies.

2. Temporary buildings.

3. Buildings not exceeding 150 square feet in floor area need not be provided with sanitation facilities for the handicapped specified in 2 MCAR § 1.15503.

4. One story buildings, other than service stations, not exceeding 2,000 square feet in floor area need not be provided with sanitation facilities for the handicapped specified in 2 MCAR § 1.15503 when approved by the Building Official.

5. Floors of buildings not used by the general public and on which handicapped persons cannot be employed because of the nature of the work.

6. Group R-1 Occupancies in which dwelling units are individually owned, sanitation facilities for the handicapped specified in 2 MCAR § 1.15503 and other facilities for the handicapped specified in 2 MCAR § 1.15504, need not be provided.

§ 1.15502 Building accessibility.

A. Definitions.

1. Ramp is a sloped walking surface within a building or attached to a building connecting levels of the building and may be part of an exit in accordance with UBC § 3306.

2. Walk is a continuous, permanently defined pathway at grade between public ways and buildings, parking areas and buildings, or between buildings.

3. Slip-resistant is any surfacing of a floor, ramp, or walk which has an anti-slip coefficient of not less than 0.40 as defined in Research Paper No. RP-1879 of the National Bureau of Standards.

B. Site approaches. Access to building entrances shall be by walks. Such walks shall be of concrete, asphaltic paving or similar permanent materials with slip-resistant surface, and shall be not less than 48 inches wide with a slope not to exceed one vertical to 20 horizontal.

C. Building entrances. At least one required exit of the building shall be accessible for use as ingress for the handicapped, and shall be identified for such use. Such building entrance shall be at the main lobby or corridor, or shall be accessible thereto by ramp or elevator.

D. Access to other stories. Access for the handicapped to other stories or levels of the building used by the general public and/or employees shall be by elevator or ramp, except the following:

1. Group R-1 Occupancies not exceeding three stories in height.

2. Other occupancies not exceeding two stories in height, and where the total occupant load is less than 100 on all floors other than the main floor.

Such ramp shall have a slip-resistant surface. It shall have a slope not to exceed one foot vertical to 12 feet horizontal and a landing at top and bottom, and where the rise exceeds three feet vertically, it shall have an intermediate landing located not to exceed two feet six inches vertically. Bottom landing shall have a minimum dimension of six feet measured in the direction of the ramp, and top and intermediate landings shall have a minimum dimension of five feet measured in the direction of the ramp. Handrails and guardrails shall be provided as required for stairs.

E. Automobile parking areas. Where automobile parking spaces are provided at least one space per 50 spaces or fraction thereof, shall be provided for the use of the handicapped, and shall be identified for such use. Such parking spaces shall be not less than 12 feet in width, and located as near as practicable to the building entrance specified in 2 MCAR § 1.15502(c).

F. Doors and doorways. Doors and doorways serving buildings or portions thereof regulated by this chapter shall comply with the following:

1. Doorways or doors in an open position shall have a clear opening width of not less than 31 inches.

2. Doors shall be operable by a single effort with one hand.

3. In doorways consisting of two door leafs, at least one door leaf shall comply with the provisions of this section. See UBC § 3303(d) for minimum exit door width.

4. Where access regulated by this chapter is through two or more sets of doors, as in a foyer, vestibule, or lobby, the space separating the doorways shall be not less than seven feet.

5. The floor or landing at doorways shall be level with, or not more than one-half inch lower than the threshold. Where the door swings over floor or landing such floor or landing shall extend not less than one foot beyond the door on the latch side.

6. In dwelling units specified in 2 MCAR § 1.15503 A. 1., entrances specified in 2 MCAR § 1.15502 C., and toilet rooms or compartments specified in 2 MCAR § 1.15503 C. 1., door opening latch hardware shall have lever handles, and shall be not more than three feet six inches above the floor.

7. Doors serving toilet rooms or stalls shall be capable of being unlocked from either side.

G. Stair tread nosing. Riser shall be slanted to meet the tread nosing edge, or where the tread extends beyond vertical risers, nosing shall be rounded and not project beyond the riser more than one inch.

H. Aisles and lanes. Where pedestrian aisles or lanes are defined with directional barriers, rails, benches, merchandise, tables, seats or fences, at least one shall have not less than 31 inches clear width for use of the handicapped and shall be identified for such use.

§ 1.15503 Sanitation facilities. Sanitation facilities may include toilets (water closets), urinals, lavatories, bathtubs, showers, sinks, and similar plumbing fixtures. For number and type of sanitation fixtures required in each occupancy, see Table 17-B.

A. Where required.

1. In Group R-1 Occupancies having eight or more dwelling units or guest rooms, sanitation facilities shall be provided in accordance with Table 55-A. In a multiple-building development, the dwelling units or guest rooms containing sanitation facilities shall not be located solely in one building.

2. In other buildings regulated by this chapter, at least one required toilet room for each sex shall have not less than one toilet and lavatory complying with this section, and where urinals are provided, not less than one urinal complying with this section. In buildings having more than one toilet room for each sex, not less than two required toilet rooms for each sex shall comply with this section. Toilet rooms having plumbing fixtures required by this section shall be identified for use by the handicapped. Buildings having a posted room directory shall list the location of such toilet rooms in the directory.

B. Location other than Group R-1 Apartment Occupancies. In buildings with an elevator or ramp, the sanitation facilities may be located at any level served by elevator or ramp. Where sanitation facilities are required in buildings without an elevator or ramp, the sanitation facilities shall be conveniently located at the required entrance level, accessible without leaving or reentering the building.

C. Sizes and clearances.

1. Toilets. Toilet rooms or compartments shall have not less than 36 inches clear space at the front of the toilet and not less than 36 inches clear width between walls, free of door swing and other obstructions. Toilet seats shall be not less than 17 inches nor more than 20 inches above the floor. Grab bars shall be provided at both sides or one side and rear of the toilet. Such grab bars shall be securely fastened to support a load of not less than 250 pounds. They shall have an outside diameter of one and one half inches and shall have one and one half inches clearance from walls and partitions.

a. A horizontal grab bar shall be mounted so that the lowest point is ten inches above the toilet seat, and extends not less than six inches in front of the toilet bowl. Grab bar shall be not less than 12 inches long.

b. A vertical grab bar shall be mounted 12 inches from the front of the toilet bowl extending from 12 inches above the height of the toilet seat to 30 inches above the toilet seat.

2. Urinals. When provided, urinals shall have a clear access width of not less than 31 inches. The front lip of the bowl of wall mounted urinals shall be not more than 18 inches above the floor.

3. Lavatories. Lavatories shall have a clear access width of not less than 31 inches, clear height of not less than 29 inches to the bottom of the fixture apron, clear height of not more than 34 inches to the rim of the fixture, and a clear depth of not less than 12 inches under the fixture exclusive of bowl and waste pipe. The water control valves shall have lever handles.

4. Bathtubs. When provided, and shower is not furnished, the bathtub shall be equipped with a flexible hose hand shower not less than six feet in length, and a vertical height adjustment bar for the shower head of not less than four feet in length. The bathtub shall have a seat, either folding, retractable or fixed, not less than 17 inches nor more than 20 inches above the tub floor and not less than 15 inches deep, and of water-resistive material. Grab bars shall be provided at one side of the bathtub. Such grab bars shall be securely fastened to support a load of not less than 250 pounds. They shall have an outside diameter of one and one half inches and shall have one and one half inches clearance from walls and partitions.

a. A horizontal grab bar shall be mounted not less than four inches nor more than six inches above the rim of the bathtub. Grab bar shall be not less than 36 inches long.

b. A vertical grab bar shall be mounted 30 inches from the end of the tub extending from a height of nine inches to a height of three feet six inches above the rim of the tub.

Water valves shall be single lever control, and shall be accessible from the seat.

5. Showers. When provided, the shower stall shall be accessible for the

handicapped with a lip or curb at entry no higher than one half inch above floor of room or stall. The shower stall shall have a seat, either folding, retractable or fixed, not less than 17 inches nor more than 20 inches above the shower floor, and not less than 15 inches deep, and of water-resistive material. Grab bars shall be provided at two sides of the shower compartment. Such grab bars shall be securely fastened to support a load of not less than 250 pounds. They shall have an outside diameter of one and one half inches and shall have one and one half inches clearance from walls and partitions.

a. A vertical grab bar shall be mounted on the wall opposite the seat extending from a height of three feet to a height of five feet above the floor of the shower.

b. A horizontal grab bar shall be mounted on the wall adjacent to the seat ten inches above the seat. Grab bar shall be not less than 18 inches long.

Water valves shall be single lever control and shall be accessible from the seat.

6. Kitchen sinks. When provided, kitchen sinks shall have a clear access width of not less than 31 inches, clear height of not less than 29 inches to the bottom of the fixture apron, clear height of not more than 34 inches to the rim of the fixture, and clear depth of not less than 12 inches under the fixture exclusive of bowl and waste pipe. The water control valves shall have lever handles.

§ 1.15504 *Other facilities.*

A. Kitchen facilities. In dwelling units in which sanitation facilities for the handicapped are required, kitchen facilities shall be provided as follows:

1. Space. Clear space of not less than five feet measured between walls, cabinets, appliances, or other obstructions shall be provided. Where cabinets have a base toe space of not less than 6" deep and eight and three fourths inches high, the clear space may be measured from such toe space.

2. Range controls. Range control handles shall be located at the front or side of the range.

3. Work space. Work space shall have a clear access width of not less than 31 inches, clear height of not less than 29 inches to the bottom, clear height of not more than 34 inches to the top, and clear depth of not less than 12 inches under the work space. The work space shall have not less than four square feet of area with a minimum dimension of 24 inches. It may be fixed, folding or retractable.

B. Toilet room accessories.

1. Mirror and/or shelves. Where mirrors and/or shelves are provided, at

least one shall be mounted so that the bottom is no higher than 40 inches above the floor.

2. Towel racks, dispensers, disposal units. Where wall-mounted towel racks, dispensers, waste disposal containers or similar appliances are provided, at least one of each shall be mounted so that working height is no higher than 40 inches above the floor, and shall be free of interference by grab bars or other appliances or fixtures.

§ 1.15505 Viewing positions in assembly occupancies.

A. Accessibility. Viewing positions required in this section shall be accessible for the handicapped by walk, ramp, or elevator, or combination thereof, through principal entrance.

B. Number. Performance viewing positions in assembly occupancies with fixed seating shall be provided in accordance with Table 55-B.

C. Space requirements. One of the following shall be provided:

1. Clear spaces free of fixed or portable seats, or with removable fixed seats.

2. Spaces with readily removable portable seats.

D. Location. Viewing positions shall be located at the main floor.

E. Floor surface. Viewing positions shall have level floor surfaces.

§ 1.15506 Controls and electrical switches.

A. Height. The top of controls for elevator controls, thermostats, manual fire alarms, and similar equipment in all buildings regulated by this chapter and electrical switches and receptacles in dwelling units regulated by this chapter shall be no higher than five feet above the floor.

§ 1.15507 Tactile identification.

A. Where required. Spaces normally used by the general public shall have tactile identification, such as raised or recessed letters, labels or plaques. The tactile identification shall not be less than four feet six inches nor more than five feet six inches above the floor, mounted on the wall adjacent to the door of the space identified, on the side nearest the door handle.

B. Floor numbers at elevators. Floor numbers shall be tactily identified for the visually handicapped by raised or recessed numbers attached to the elevator door jamb at each floor, not less than three feet six inches nor more than four feet six inches in height above the floor.

C. Elevator controls. Elevator controls shall have tactile identification by raised or recessed letters, labels or plaques.

D. Door handles. Doors to stairs other than exit stairs, loading platforms, boiler rooms, stages, and doors serving other hazardous locations shall have knurled or similarly marked door handles.

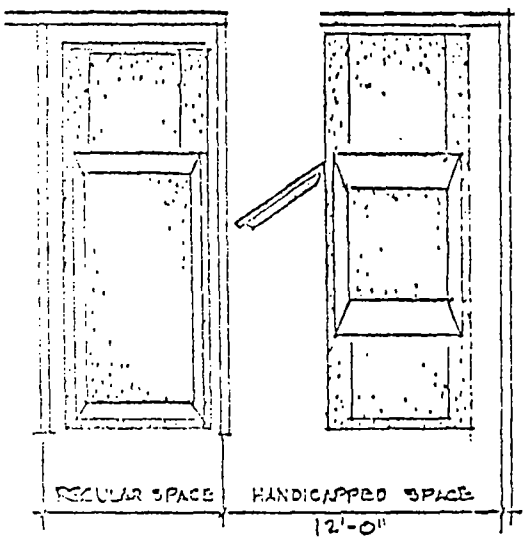
§ 1.15508 Figures. Figures 55-1 through 55-18 of this chapter are illustrative only. See appropriate chapter sections for specific provisions.

Table 55-A
Sanitation Facilities for the Handicapped

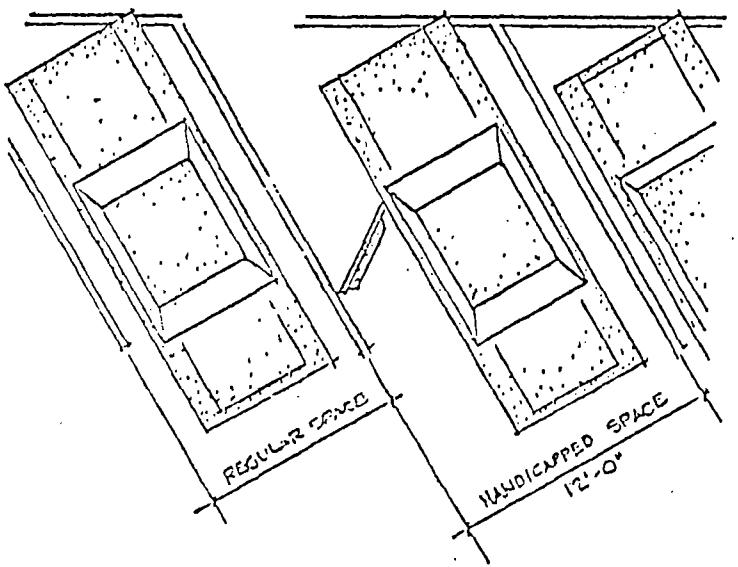
Number of Dwelling Units/ Guest Rooms in Building	Number of Dwelling Units/Guest Rooms requiring Sanitation Facilities
0- 7	0
8- 39	1
40- 59	2
60- 79	3
80- 99	4
100-119	5
120-139	6
140-159	7
160-179	8
180-199	9
200-	10 plus 1 per each 50 units exceeding 200

Table 55-B
Viewing Positions

Motion Picture Auditoriums	
Occupant Load	Minimum Viewing Positions
500 and Less	4
Over 500	8
Other Assembly Occupancies	
500 and Less	4
501-1000	12
1001-1500	16
Over 1500	16 plus 1 per 500 additional

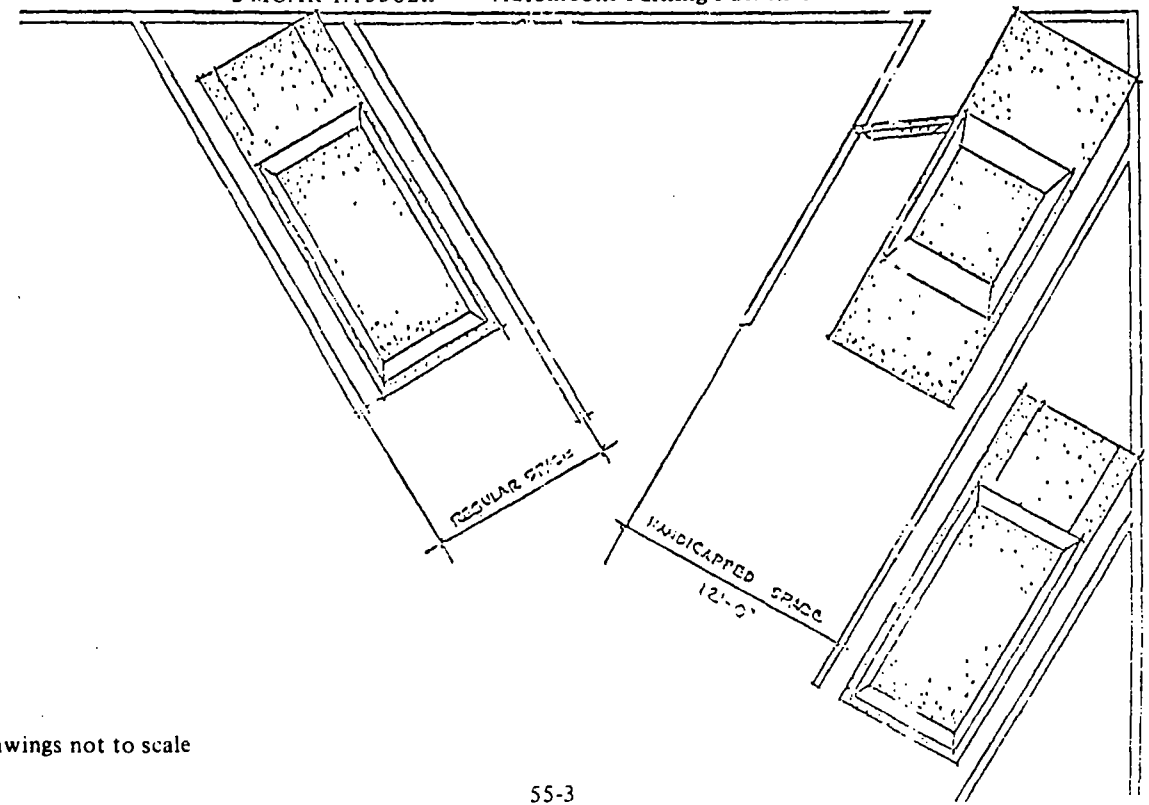


55-1

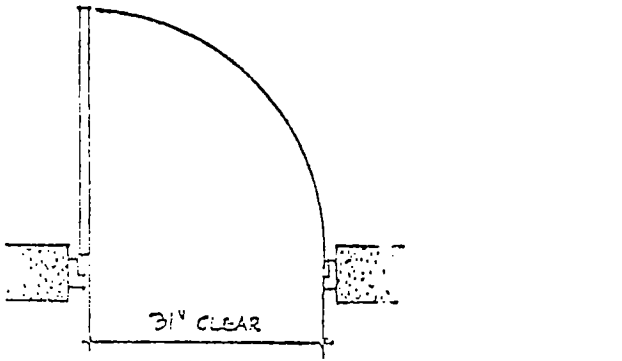


55-2

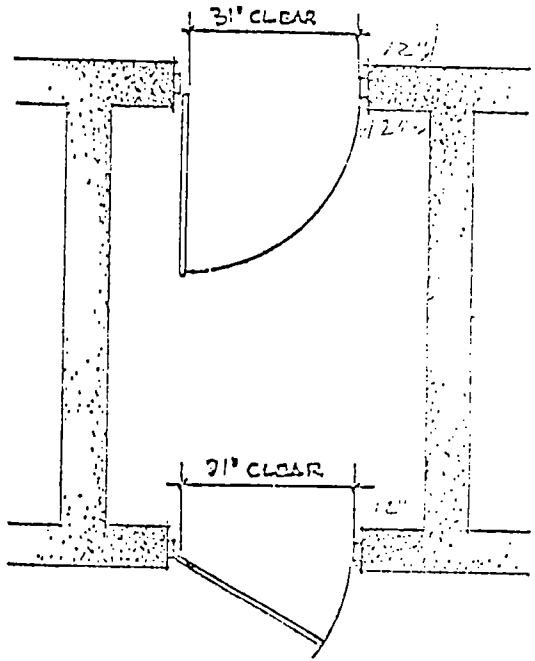
Drawings not to scale



Drawings not to scale

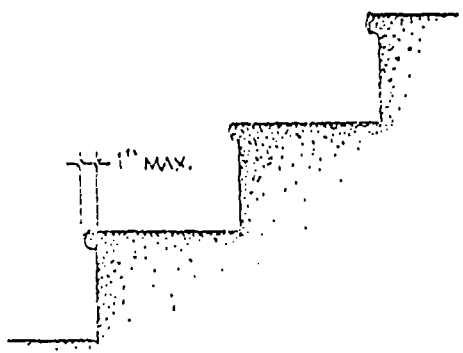


55-5

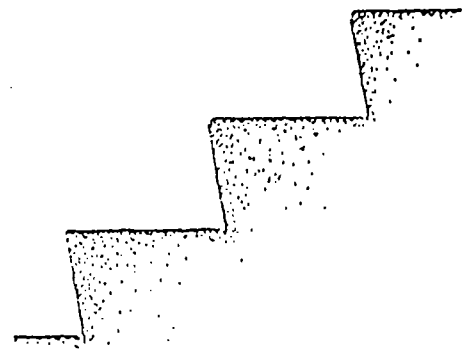


55-6

Drawings not to scale



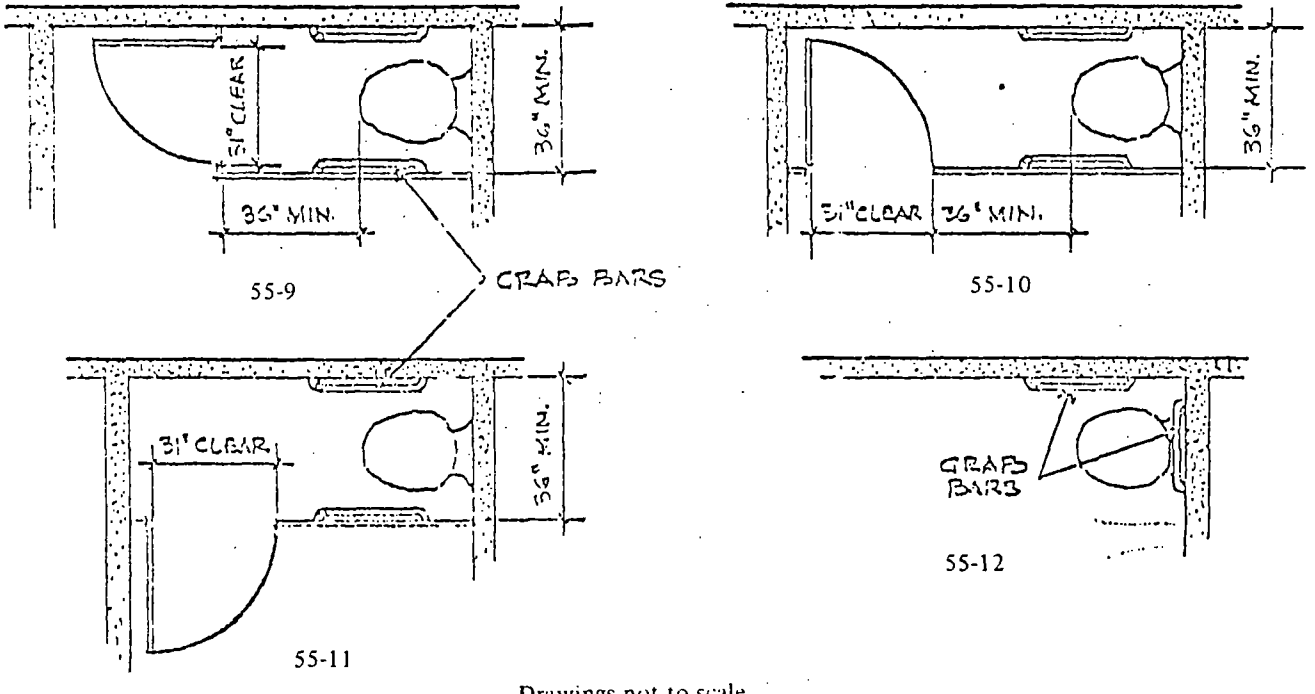
55-7



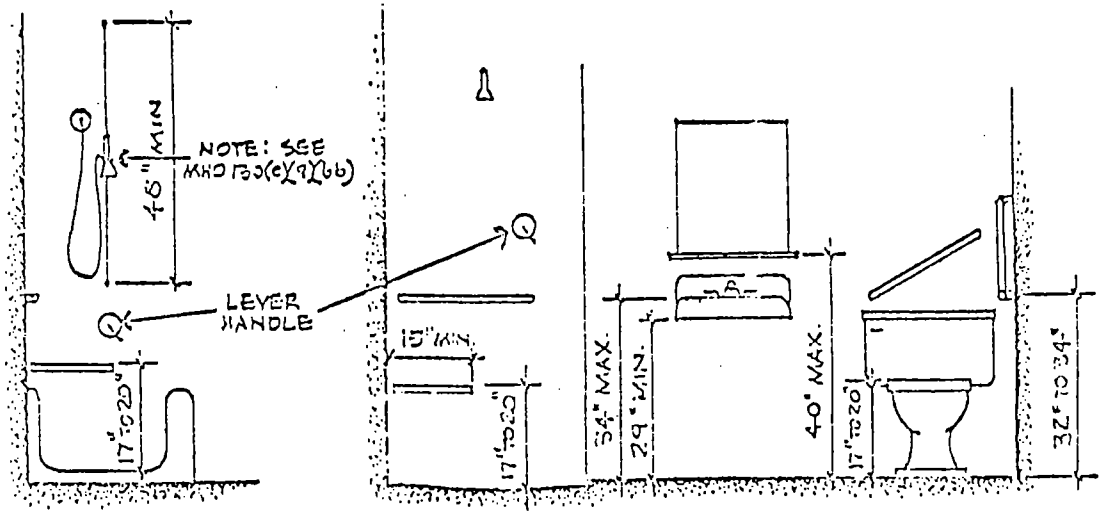
55-8

Drawings not to scale

2 MCAR 1.15503C. Sizes and Clearances



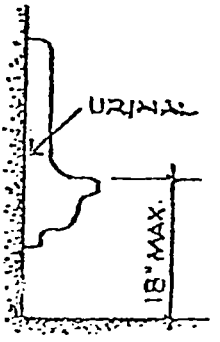
Drawings not to scale



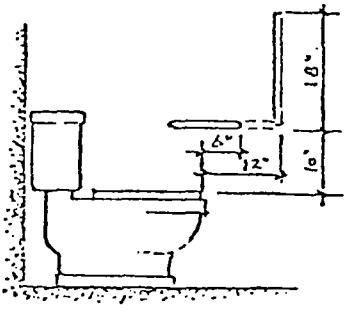
55-13 55-14

Drawings not to scale

2 MCAR 1.15503C. Sizes and Clearances

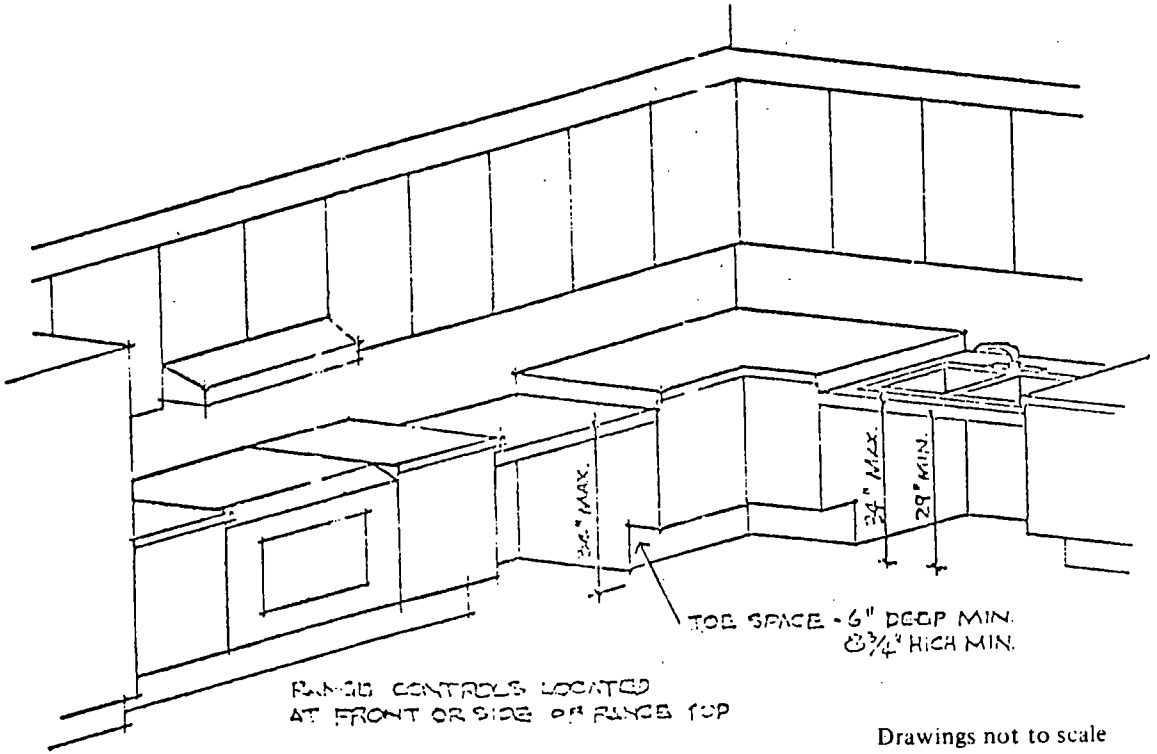


55-15a



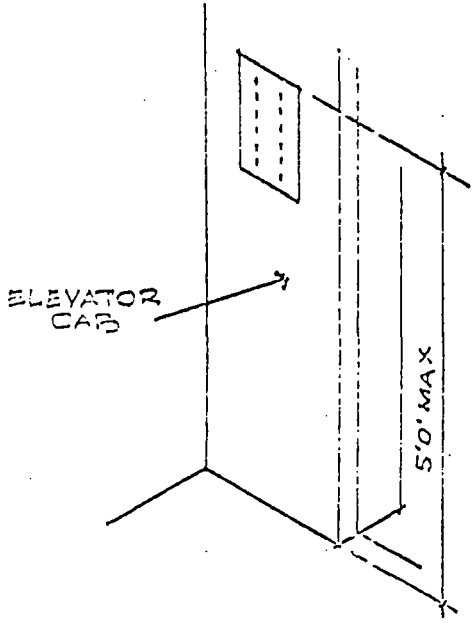
55-15b

Drawings not to scale



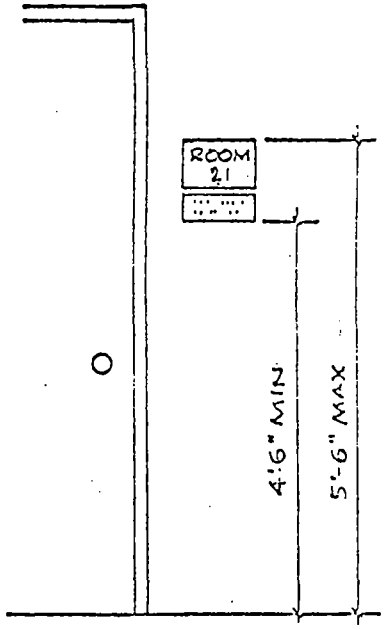
Drawings not to scale

2 MCAR 1.15506B Elevator Controls



55-17

2 MCAR 1.15507 Identification



55-18

Drawings not to scale

2 MCAR S 1.15530 Title and rules. The rules contained herein, 2 MCAR SS 1.15530-1.15538, shall be part of the Minnesota State Building Code.

2 MCAR S 1.15531 Authorization and purpose. 2 MCAR SS 1.15530-1.15538 are authorized by Minnesota Statutes, section 16.8632 (1978) regarding display of the symbol of accessibility indicating access to buildings, facilities and grounds which are accessible to and usable by handicapped persons.

2 MCAR S 1.15532 Scope. These rules apply to all new and existing buildings, facilities and grounds within the state of Minnesota on which the owner(s) or operator(s) desires to display the symbol of accessibility. The rules establishing handicapped accessibility to and within structures shall be contained in the code.

2 MCAR S 1.15533 Enforcement. These rules shall be enforced in the same manner as other provisions of the Minnesota State Building Code.

2 MCAR S 1.15534 Definitions. All terms in these rules shall have the meaning as defined in this code except for the following which shall be defined as indicated:

A. "Symbol" means the symbol adopted by Rehabilitation Internationals Eleventh World Congress, pursuant to Minnesota Statutes, section 16.8632, subdivision 2.

B. "Existing buildings" means any building built prior to January 1, 1976.

2 MCAR S 1.15535 Display of symbol. The owner(s) or operator(s) of new or existing buildings, facilities, and/or grounds may display the symbol of accessibility after the following criteria have been met:

A. A certificate of occupancy is issued by the building official pursuant to the State Building Code 2 MCAR S 1.10111, UBC section 306. or,

B. The owner(s) or operator(s) obtain(s) an affidavit of compliance prepared and signed by a Minnesota registered architect or engineer, Minnesota certified building official or approved inspection agency. The affidavit shall contain the statement that the buildings, facilities and/or grounds are in compliance with the code and the Minnesota Statutes pertaining to handicapped accessibility. The affidavit shall specifically address all accessibility features required by the state building code on a standard form furnished for that purpose.

2 MCAR S 1.15536 Appeals. All appeals regarding compliance with accessibility standards as required by 2 MCAR S 1.15535 shall be brought pursuant to 2 MCAR S 1.10111, UBC section 204.

2 MCAR S 1.15537 Issuance. After compliance with the rules of this section, 2 MCAR SS 1.15530-1.15538, and upon request of the owner(s) and operator(s), the building official shall issue the symbol.

A. A municipality which determines to evaluate existing buildings for accessibility under 2 MCAR S 1.15535 B. shall adopt a reasonable schedule of fees based on its cost of inspection. No charge or fee shall be imposed for the issuance of the symbol.

2 MCAR S 1.15538 Placement of symbol. The symbol when issued shall be affixed on the approved building(s), facility(ies), or grounds in the following manner:

A. Buildings. The symbol shall be affixed to the door of the accessible entrance 36" above the walking surface and within 12" of the latch, pull, or lever handle.

B. Facilities. The symbol shall be affixed to an 8" x 12" sign blank or board mounted on a post 42" above grade (center line of sign) within 60" of said facility.

C. Grounds. The symbol shall be affixed to an 8" x 12" sign blank or board mounted on a post 42" above grade (center line of sign) within 60" of a public way.

2 MCAR 55 1.16001; 1.16002; 1.16003; 1.16004; 1.16005; 1.16006 are repealed 8 SR 1229 11-21-83

see new rule 03575T →

DEPARTMENT OF ADMINISTRATION

BUILDING CODE DIVISION

DESIGN AND EVALUATION CRITERIA for ENERGY CONSERVATION IN NEW BUILDINGS, ADDITIONS, REMODELED ELEMENTS OF BUILDINGS and STANDARDS FOR CERTAIN EXISTING PUBLIC BUILDINGS

§ 1.16001 Authorization. These rules are authorized by Minn. Stat. § 116H.12, subd. 4 (1974) and Minn. Stat. § 116H.121 (1976) and established through the rulemaking procedures set forth in Minn. Stat. §§ 15.0411 to 15.052 (Supp. 1975) in order to carry out the provisions of §§ 116H.12, subd. 4 and 116H.121, regarding energy conservation standards for design, evaluation and construction of all new buildings and the remodeling or reconstruction undertaken after the effective date of these rules. Additionally these rules are intended as the energy conservation standards for the survey of certain public buildings, defined by Statute as "buildings owned by the State and the University of Minnesota." These Rules constitute amendments to the State Building Code. In the event that these Rules differ with the State Building Code, these Rules shall govern in all cases not affecting safety and health requirements. Additionally these Rules and the Standard are intended to be used in the required survey of buildings owned by cities, counties and school districts. Compliance with these Rules and the referenced standards shall not be mandatory for existing buildings owned by the city, county or school district.

§ 1.16002 Enforcement.

A. Building Officials, in the municipality for which they are appointed, shall enforce these Rules.

B. In all other areas of the State these Rules shall be enforced by the Commissioner of Administration or his designated representatives. The fees for such enforcement shall be based on the schedule established in Chapter 3 of the Uniform Building Code, as adopted SBC 201 (2MCAR § 1.10201).

§ 1.16003 Purpose. The purpose of these Rules is to provide design requirements which will improve utilization of energy in new buildings, additions, remodeled elements of buildings and certain existing public buildings.

A. The requirements of these Rules are directed toward the design or modification of building envelopes to provide adequate thermal resistance and low air leakage and toward the design or redesign and selection of mechanical, electrical service, and illumination systems and equipment which will enable the effective use of energy in buildings.

B. It is intended that these Rules be flexible in order that designers be encouraged to use innovative approaches and techniques to achieve effective conservation of energy. More effective use of energy may be achieved by the use of alternate design solutions, which follow the specific requirements of Sections 10 and/or 11 of the Standard referenced in 2 MCAR § 1.16005.

C. It is intended that these Rules, and the referenced standard, by used in the design of new buildings, additions, for remodeled elements of existing buildings as well as being applicable to certain existing public buildings as defined in 2 MCAR § 1.16001. Compliance with the requirements should be determinable and be economically justifiable in the preconstruction stage by evaluation and analysis of design specifications, drawings and calculations.

D. These Rules are not intended to abridge any safety or health requirements.

§ 1.16004 Scope.

A. These Rules and the referenced Standard set forth requirements for the design of new buildings as enumerated below, covering their exterior envelopes and selection of their HVAC, service water heating, electrical distribution and illuminating systems, and equipment, for effective use of energy.

1. These Rules and the referenced Standard apply to new buildings, additions, remodeled elements as well as certain existing public buildings.

2. Buildings or portions thereof whose peak design rate of energy usage is less than 1 w/ft^2 (3.4 Btu/h ft^2)(10.8 w/m^2) of floor area for all purposes are excluded from the scope of this standard.

3. Certain other buildings or elements thereof may be exempt when design data are not available or not applicable. In these cases, the exemptions are specifically noted in the sections of the referenced Standard.

B. These Rules and the referenced Standard do not cover specific procedures for the operation, maintenance and use of buildings.

§ 1.16005 Adoption of ASHRAE Standard 90-75 by reference. Sections 3.0 through 11, attachments and appendices of the 1975 Edition of ASHRAE Standard 90-75, hereinafter referred to as Standard 90, as promulgated and published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., is incorporated by reference and hereby made part of the State Building Code and shall be subject to the following alterations and amendments.

Section 3 of Standard 90 is amended to read as follows:

A. Page 9, Definitions.

Heated space. Space, within a building, which is provided with a positive heat supply to maintain air temperature of 50°F (10°C) or higher. This definition is not to be construed to require the insulation of floor assemblies above basements or crawl spaced in Type A buildings provided with a positive heat supply.

B. Page 10, Definitions.

Manufactured building. Delete in its entirety.

Mobile home. Delete in its entirety.

Commercial parking facility. Shall not include a parking facility which is appurtenant to or a part of a residential building whether the individual dwelling units are rented or owned by the occupants, and which is used primarily by the occupants and their guests.

New building. As used hereafter shall mean new buildings, additions, remodeled elements of buildings, and certain existing public buildings.

C. Page 12, 4.2.1.1.

In addition to the criteria set forth in this section, the proposed design shall consider energy conservation in determining the orientation of the building on its site; the geometric shape of the building; the building aspect ratio (ratio of length to width); the number of stories for a given floor area requirement; the thermal mass of the building; the exterior surface color; shading or reflections from adjacent structures, surrounding surfaces or vegetation; opportunities for natural ventilation; and wind direction and speed. Calculation procedures and information contained in Chapters 17-22 of the 1972 ASHRAE HANDBOOK OF FUNDAMENTALS[1-6] may be used as guidelines to evaluate the above factors.

D. Page 12, Exterior Envelope Requirements.

4.2.7 The design of buildings for energy conservation shall not create conditions of accelerated deterioration from moisture condensation. Vapor barriers are required to maintain the thermal performance of required building insulation against cold weather water vapor condensation in all Type A Buildings (Perm Rating 1.0 maximum).

E. Page 18.

4.3.2.4 Slab-on-Grade Floors. For slab-on-grade floors, the thermal resistance of the insulation around the perimeter of the floor shall be as shown in Fig. 2. The insulation shall extend downward from the top of the slab to the design frost line or downward to the bottom of the slab then horizontally beneath the slab for an equivalent distance.

F. Page 18.

4.4.2.4 Slab-on-Grade Floors. For slab-on-grade floors, the thermal resistance of insulation around the perimeter of the floor shall be as shown in Fig. 2. The insulation shall extend downward from the top of the slab to the design frost line or downward to the bottom of the slab then horizontally beneath the slab for an equivalent distance.

G. Page 20.

5.2 Scope. This section covers determination of heating and cooling loads, design requirements, and control requirements for general comfort applications in new buildings. Criteria are established for insulating HVAC systems and for duct construction. EXCEPTIONS. Special applications, such as but not limited to hospitals, laboratories, thermally sensitive equipment, computer rooms and areas with open refrigerated display cases, are exempt from the requirements of this section. Where these special applications are described in the 1974 ASHRAE Handbook and Product Directory, Applications Volume [1], the criteria described there shall be used.

No enclosed structure or portion of an enclosed structure constructed after January 1, 1978 and used primarily as a commercial parking facility for three or more motor vehicles shall be heated. Incidental heating resulting from building exhaust air passing through a parking facility shall not be prohibited, provided that substantially all useful heat has previously been removed from the air.

H. Page 22, References–add Footnote 17.

17. "Monthly normals of temperature, precipitation and heating degree days 1941-70", U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, National Climatic Center, Asheville, North Carolina, August, 1973.

I. Page 22, Exceptions.

Special applications, such as but not limited to hospitals, laboratories, thermally sensitive equipment, computer rooms and areas with open refrigerated display cases, are exempt from the requirements of this section. Where these special applications are described in the 1974 ASHRAE HANDBOOK & Product Directory, Applications Volume [1], the criteria described therein shall be used.

J. Page 23.

5.3.2.3 Ventilation. Ventilation air shall conform to ASHRAE Standard 62-73 "Natural and Mechanical Ventilation."[6] Ventilation air quantities identified in SBC 7705 (2 MCAR § 1.17705) through SBC 7720 (2 MCAR § 1.17720) shall be used in lieu of those contained in Standard 62-73 whenever this will reduce ventilation air quantities.

K. Page 23.

5.3.2.5 System Design Heating/Cooling Capacity. The rated capacity of the heating/cooling system at design conditions shall not be greater than 115% for heating, 100% for cooling at design output load calculated in accordance with Sec. 5.3, whenever appropriate equipment is available. Equipment designed for standby purposes is not included in this capacity limitation requirement. The cooling capacity of heat pumps are exempt from this limitation.

L. Page 23.

5.4.3.1 One- and Two-Family Dwelling Units, Attached or Detached.

M. Page 25, Exceptions.

d. The use of outdoor air cooling may affect the operation of other systems (such as return or exhaust air fans or areas with open refrigeration display cases) so as to increase the overall energy consumption of the building.

N. Page 32.

7.3.1.1 is deleted in its entirety.

O. Page 33.

7.3.1.2 is deleted in its entirety.

P. Page 33.

7.3.2 Combination Service Water Heating/Space Heating Boilers. Service water heating equipment shall not be dependent on year-round operation of space heating boilers; that is, boilers that have as another function winter space heating.

Q. Page 34.

7.8 Swimming Pools.

7.8.1 Heated swimming pools shall be equipped with controls to limit heating water temperatures to no more than 84°F (28.9°C).

R. Page 34.

8.6 Electric Energy Determination. In any multi-tenant residential building, provisions shall be made to separately determine the energy consumed by each tenant.

Electrical service to individual dwelling units in buildings containing two or more units shall be separately metered, with individual metering readily accessible to the individual occupants.

EXCEPTION: Buildings intended for occupancy primarily by persons who are 62 years of age or older or handicapped, or which contain a majority of units not equipped with complete kitchen facilities, shall be exempt from the provisions of this section.

S. Page 38.

ATTACHMENT A TO SECTION 9 (9.3.4.1)

T. Page 41.

ATTACHMENT B TO SECTION 9 (9.3.5)

U. Page 46.

ATTACHMENT C TO SECTION 9

V. Page 51.

Appendix I

W. Page 52.

Appendix II

X. Page 53.

Sheet Metal and Air Conditioning Contractors
National Association, Inc. (SMACNA)

8224 Old Courthouse Road
Vienna, VA 22108

Y. Page 53.

Appendix III is deleted in its entirety.

§ 1.16006 Required procedure for exemption.

A. Any person seeking exemption from the requirements of these Rules and the referenced Standard shall submit a request, supported by evaluation and documentation, to the Building Official of the municipality where the building permit is required.

B. In those areas of the State where the State Building Code does not apply, such request for exemption shall be submitted to the State Building Inspector, supported by same documentation as required by 2 MCAR §§ 1.16006 A.

DEPARTMENT OF ADMINISTRATION

BUILDING CODE DIVISION

Standards of Performance for Solar Energy Systems and Subsystems Applied to Energy Needs of Buildings

§ 1.16101 Purpose.

A. These Rules are authorized by Minn. Stat. §§ 116H.127 and 16.85 (1976) and established through the rule making procedures set forth at Minn. Stat. § 15.0411, et seq.

B. These Rules shall apply to solar energy systems which are used to satisfy space heating and/or space cooling and/or domestic or service hot water demands of buildings, and shall be used for all solar energy systems and subsystems as those terms are defined at 2 MCAR § 1.16105 herein. These Rules are to be used in conjunction with existing Building Codes and Standards and do not replace existing Building Codes.

C. The purpose of these Rules is twofold: first, to establish standards for the evaluation of the performance, durability, reliability and maintainability of solar energy systems and subsystems; and second, to require disclosure by the seller to each potential buyer of the extent to which the seller's solar energy system or subsystem meets or exceeds the Standards set forth at 2 MCAR §§ 1.16106 and 1.16107 herein.

D. The Standards set forth herein are in reasonable conformance with Interim Performance Criteria for Commercial Solar Heating/Cooling Systems and Facilities (NASA), Interim Performance Criteria for Solar Heating and Combined Heating/Cooling Systems and Dwellings (NBS), and Intermediate Minimum Property Standards for Solar Heating and Domestic Hot Water Systems (HUD).

E. The Standards set forth herein are intended to serve as a model for evaluating solar energy system or subsystem performance. These Rules require that the seller determine and disclose the extent to which its system or subsystem meets or exceeds these Standards. These Rules do not require the seller to comply with the Standards.

§ 1.16102 Enforcement.

A. The building official in each municipality shall enforce the Rules set forth in 2 MCAR § 1.16103 herein. The building official shall not issue any permits required for installation of the electrical, mechanical or structural aspects of the solar energy system or subsystem until the seller has furnished the building official a copy of the completed Disclosure Statement Form required by these Rules. However, the building official shall not be required to

determine the accuracy of the seller's disclosures or to otherwise determine the extent to which the seller's solar energy system or subsystem meets or exceeds the Standards set forth in 2 MCAR §§ 1.16106 and 1.16107 herein.

B. Any person who violates the provisions of these Rules or knowingly submits false information in the required Disclosure Statement Form shall be guilty of a misdemeanor and may be subject to a civil penalty of not more than $10,000 for each violation. See Minn. Stat. § 116H.15 (1976).

§ 1.16103 Rules.

A. Every seller of a solar energy system or subsystem shall inform every bonafide prospective buyer of the extent to which the seller's system or subsystem meets or exceeds the Standards set forth at 2 MCAR §§ 1.16106 and 1.16107 herein.

B. The information required by 2 MCAR § 1.16103 A. above shall be provided on the Disclosure Statement Form set forth at 2 MCAR §§ 1.16104 A. and 1.16104 B.

C. A copy of the operation and maintenance manual described at 2 MCAR § 1.6106.6 herein shall be available for review by a bonafide prospective buyer, and shall be provided to each buyer upon sale of the solar energy system or subsystem.

D. The seller of a solar energy system or subsystem shall complete the Disclosure Statement Form, including 2 MCAR § 1.16104 C. and shall submit copies to the buyer at the time of sale and to the municipal building official prior to installation.

E. Where the solar energy system or subsystem includes flat plate collectors, or any other collectors whose thermal performance is capable of being rated in accordance with ASHRAE Standard 93-77 "Methods of Testing to Determine the Thermal Performance of Solar Collectors", such collectors shall be tested in accordance with the methods set forth at ASHRAE Standard 93-77. No other tests are required by these Rules; however, the seller shall fully disclose on the Disclosure Statement Form the bases for its determinations as required on the Disclosure Statement Form, and where the determinations are not substantiated by testing, the seller shall so indicate.

§ 1.16104 Disclosure statement.

A. Compliance. The purpose of this Statement is to disclose to the buyer the extent to which this system meets the standards for solar systems set forth in the State Building Code.

1. This system/subsystem/component meets or exceeds the standards set forth at State Building Code 2 MCAR §§ 1.16106 and 1.16107 except as noted in 3 below.

2. The seller's determination that these standards have or have not been met are based on the following tests, computations, and documentation, which are available for review by the buyer:

SBC SECTION	TESTS, COMPUTATIONS, AND DOCUMENTATION

3. This system (subsystem/component) does not meet or exceed the standards set forth at State Building Code 2 MCAR §§ 1.16106 and 1.16107 in the following respects:

4. The seller may explain below any reasons for the system (subsystem or component) not meeting the standards set forth at State Building Code 2 MCAR §§ 1.16106 and 1.16107 and may indicate the extent to which the system does meet the standard.

B. Design life. The manufacturer of solar energy systems shall outline herein the design life of systems and subsystems under anticipated design conditions. This is not a warranty or a guarantee of this life.

1. Design life of solar energy system, with normal maintenance as described by manufacturer _____
2. Design life of subsystems and components, with normal maintenance as described by manufacturer
   - Collector subsystem _____
   - Transport subsystem _____
   - Storage subsystem _____
   - Control subsystem _____

C. Solar energy system performance.

Sizing. Sizing of the previously identified solar energy system is outlined below. All load calculations are performed in accordance with Appendix A and/or B.

Calculated facility heating consumption _____
Calculated service hot water consumption _____
Calculated facility cooling consumption _____
Other calculated facility energy consumption as may be offset by solar energy system. _____
TOTAL CALCULATED FACILITY CONSUMPTION _____

Solar Contribution. Solar contribution, as calculated in accordance with Appendix B, shall be provided as follows: (Calculations which have been substantiated by field testing of solar system/subsystems and components are an acceptable submission in lieu of Appendix B Calculation Procedures.)

Calculated solar contribution to space heating consumption ____%
Calculated solar contribution to service hot water consumption ____%
Calculated solar contribution to facility cooling consumption ____%
Calculated solar contribution to other consumption ____%
CALCULATED SOLAR CONTRIBUTION TO TOTAL CONSUMPTION ____%

§ 1.16105 Definitions.

Abbreviations.	DHW	Domestic Hot Water
	H	Heating
	HC	Heating/Cooling
	UV	Ultra violet

Absorptance. The ration of the amount of radiation absorbed by a surface to the amount of radiation incident upon it.

Absorptivity. The capacity of a material to absorb radiant energy.

Active solar system (Flat plate or concentrating collector based). A system characterized by the use of powered mechanical equipment to move the heat transfer fluid (liquid or gas) through a collector and from a collector to load or storage.

Auxiliary energy subsystem. Equipment utilizing conventional energy sources both to supplement the output provided by the solar energy system and to provide full energy backup during periods when the solar H or DHW systems are inoperable.

Cathodic protection. Corrosion protection against electrolytic reactions.

Chemical compatibility. The ability of materials and components in contact with each other to resist mutual chemical degradation, such as the chemical degradation caused by electrolytic action or plasticizer migration.

Collector efficiency (instantaneous). The ratio of the amount of energy removed by the transfer fluid per unit of aperture (entrance window area) over a 15 minute period to the total incident solar radiation onto the same collector area for the same 15 minute period (as defined by NBSIR 74-635).

Collector subsystem. The assembly for absorbing solar radiation, converting it into thermal energy, and transferring the thermal energy to a heat transfer fluid.

Combined system (combined collectors and storage devices). A combined component system characterized by a system with integral construction and operation of the components such that the solar radiation collection and storage phenomena cannot be measured separately in terms of flow rate and temperature changes.

Control subsystem. An assembly of devices and its electrical, pneumatic or hydraulic auxiliaries used to regulate the processes of collecting, transporting, storing and utilizing energy.

Design life. The period of time during which a solar energy system or component is expected to perform without major maintenance or replacement.

Dielectric fitting. An insulating or nonconducting fitting used to isolate electrochemically dissimilar materials.

Emittance. The ratio of the radiant energy emitted by a body to the radiant energy emitted by a black body at the same temperature.

Facility. Means a building or structure including appliances, heating or cooling equipment, industrial or manufacturing processes to be served by the solar energy system.

Flow condition. The condition existing in the solar energy system when the heat transfer fluid is flowing through the collector under normal operating conditions.

Fluid requiring special handling. Fluid which is a "highly toxic substance" or a "toxic substance" as defined by paragraphs 191.1(e) and (f) of the Federal Hazardous Substances Labeling Act, Regulations, Part 191, Chapter I, Title 21(A); or fluid having a degree of flammability such that it is a "flammable substance" or an "extremely flammable substance" as defined by application of the Tagliabue Open-Cup Flash Point Test (stated in the Hazardous Substances Act, Public Law 86-613, July 12, 1960).

Heat generated cooling. The use of thermal energy to operate an absorption refrigerating unit.

Heating degree days. The number of degrees that the daily mean temperature is below 18.3°C. (65°F.).

Maximum "flow" temperature. The maximum temperature obtained in a component when the heat transfer fluid is flowing through the system.

Maximum "no-flow" temperature. The maximum temperature obtained in a component when the heat transfer fluid is not flowing through the system.

Maximum service temperature. The maximum temperature to which a component will be exposed in actual service, either with or without the flow of heat transfer fluid.

Operating energy. The conventional energy required to operate the H, HC and HW systems, excluding any auxiliary energy which supplements the solar energy collected by the systems (e.g., the electrical energy required to operate the energy transport and control subsystems).

Outgassing. The emission of gases by component materials usually during exposure to elevated temperature or reduced pressure.

Passive solar system (Integral collector, storage and building). A passive system characterized by collector and storage components which are an integral part of the building. Auxiliary energy may be used for control purposes but heating is achieved by natural heat transfer phenomena. Roof ponds, modi-

fied walls, roof sections with skylights, or similar applications where solar energy is used to supply a measurable fraction of the building heating requirements are examples of passive systems.

Solar energy system. An assembly of subsystems and components which is designed to convert solar energy into thermal energy.

Transmittance. The ratio of the radiant flux transmitted through and emerging from a body to the total flux incident on it.

§ 1.16106 Standards for evaluation of solar energy systems.

A. Scope. This section contains design criteria for evaluation of performance and quality of solar systems.

B. Solar system performance. The solar system shall be capable of collecting and converting solar energy into thermal energy. The thermal energy shall be used to meet the total energy needs for space heating, cooling and water heating alone or in combination with storage and auxiliary energy, as required. The solar system shall supply more energy to the demand of the facility for which it is installed than is required for the solar systems.

1. Solar energy system sizing. The solar system combination shall be based upon monthly average heat loads determined by a degree-day method using average monthly design temperature and conditions as the maximum analytical time interval. Building heat loss shall be determined by historical energy use data or calculation. Calculation of building heat loss for use in sizing solar energy systems shall be performed for the full heating and/or cooling season using the method described in Appendix B.

2. Solar energy system contribution. The average yearly contribution of solar energy to the operation of the solar systems shall be specified in the Disclosure Statement and shall result in a reduction in the annual consumption of conventional energy. The solar energy contribution shall be determined as a percentage of the average annual space conditioning and water heating energy requirements less solar system operating energy demand. Analytical simulations or correlations based upon simulations combining the building heating and cooling loads, solar system performance and climatic conditions shall be utilized to predict the average monthly and annual energy contribution to be provided by solar energy, auxiliary energy and electrical operating energy as illustrated in Appendix B. (Calculations which have been substantiated by field testing of solar system/subsystems and components are an acceptable submission in lieu of Appendix B Calculation Procedures.)

C. Durability and reliability.

1. Structural. The structural design of the solar system including connections and supporting structural elements shall be based on loads anticipated during the design life of the systems.

a. Service loads. The following additional loads shall be used in the structural design of conventional and non-conventional elements and connections of H, HC and DHW systems:

(1) Constraint loads caused by the environment, normal functioning of the system and time-dependent changes within the materials of the system shall be taken as the most sever likely to be encountered during the design life.

(2) Ice loads (I) shall be taken as those produced by the accumulation of ice on surfaces exposed to the natural environment. The thickness of ice shall be taken as a radial thickness of ½ inch.

(3) Hail loads. System components and supporting structural elements that will be exposed to the natural environment in service shall be designed to resist, without excessive damage or major impairment of the functioning of the system, the perpendicular impact of falling hail having a particle diameter of ¾ inch. "Excessive damage or major impairment" shall not include punching or local cracking of nonstructural elements such as glass cover plates of collector panels under hail impact, but shall include damage which creates a major curtailment in the functioning of the system, premature failure or hazards created by excessive shattering of glazed elements.

2. Mechanical stresses. Mechanical stresses that arise within the system shall not cause damage or malfunction of the system or its components.

a. Vibration stress levels. Vibrations in collectors, piping, ducts, instrumentation lines, and control devices shall be controlled to reduce stress levels below those that could cause fatigue and subsequent component damage.

b. Components involving moving parts. Components that involve moving parts shall be capable of performing their intended function without excessive wear or deterioration for their design lives with normal maintenance.

c. Wear and fatigue. Check valves, pressure regulators, pumps, electrical switches, and similar components shall be capable of operating under in-use conditions for their design lifespans without exhibiting wear or fatigue to a degree that would effect the performance as declared in Disclosure Statement form.

d. Flexible joints. All systems employing heat transfer fluids shall be designed to accommodate flexing of subsystems and components.

3. Temperature and pressure resistance. Components shall be capable of performing their functions for their design lives when exposed to the temperatures and pressures that may develop in the system under both flow and no-flow conditions.

a. Thermal cycling stresses. The solar energy system shall be capable of withstanding the stresses induced by thermal cycling for their respective design lives.

b. Thermal changes. The solar energy system shall be designed to allow for the thermal contraction and expansion that may occur over the service temperature range.

c. Thermal degradation. Solar energy systems shall not thermally degrade to the extent that their function will be reduced to a degree that will effect the performance as declared in Appendix A.

d. Relief valves and vents. As required for protection of a particular system design, combination temperature and pressure relief valves, vacuum relief valves, separate pressure relief valves, pressure reducing valves, and/or atmospheric vents shall be provided.

4. Materials compatibility. All materials which are joined to or in contact with other materials shall have sufficient chemical compatibility with those materials to prevent deterioration that may impair their functions to a degree that would effect the performance as declared in Disclosure Statement form. Allowances shall be made for differences in the expansion of jointed materials.

a. Corrosion of dissimilar materials. Non-isolated dissimilar materials with or without corrosion resistant finishes, where used either in contact with a transfer fluid, or without such contact, shall not be corroded to the extent that their function is or may be impaired under in-use conditions during their intended design lives. Dissimilar materials joined to form the transport system shall be electrically isolated from each other unless documentation is provided to demonstrate that the joints are sufficiently compatible to prevent corrosive wear and deterioration to the extent that their function would be impaired to a degree that would effect the performance as declared in Disclosure Statement form.

b. Corrosion by leachable substances. Chemical substances that can be leached by moisture from any of the materials within the system shall not cause corrosive deterioration of any other components that may impair the ability of these components to perform their intended function as declared in Disclosure Statement form.

c. Effects of decomposition products. Chemical decomposition products that are expelled from components under in-use conditions shall not cause the degradation of other components within the system to the extent that it would impair their ability to perform their intended functions to a degree that would effect the performance as declared in Disclosure Statement.

5. Erosion/Corrosion. The solar system and components shall not be adversely affected by erosive wear (such as by the flow of a liquid transfer

medium) to an extent that will impair their functions during their intended design lives.

6. Heat or humidity transfer effects. Heat or humidity transfer from the collector, thermal storage, piping or other components of the solar system or subsystem shall not interfere with the efficient operation of the solar system or cause loss of control of temperature, humidity or other controlled conditions.

7. Effects of external environment. The solar systems for heating (H) and combined heating and cooling (HC) and the hot water (HW) system/subsystem and their components shall not be affected by external environmental factors to an extent that will impair their performance as declared in Disclosure Statement form.

a. Solar degradation. Components or materials that are exposed to sunlight shall not undergo changes in their properties during their design lives that would impair the function of the system to a degree that would effect the performance as declared in Disclosure Statement form. When components or materials are exposed to UV radiation in combination with an intermittent water spray at their maximum "no-flow" temperature, there shall be no excessive deterioration such as cracking, crazing, embrittlement, etching, loss of adhesion, changes in permeability, loss in flexural strength or any other changes that may affect the performance of the components in the system.

b. Soil corrosion. Materials that are intended to be buried in soils shall not be degraded under in-use conditions to an extent that may impair their functions during their intended design lives.

c. Airborne pollutants. Materials exposed under in-use conditions to airborne pollutants such as ozone, salt spray, sulfur dioxide, oxides of nitrogen and/or hydrogen chloride shall not be affected by those pollutants to an extent that may impair their functions during their intended design lives.

d. Growth of fungi. Components and materials used in the solar systems shall not promote the growth of fungi, mold or mildew.

D. Maintainability.

1. Accessibility for maintenance and servicing. The solar system shall be designed, constructed, and installed to provide adequate access for general maintenance and convenient servicing.

2. Service personnel. The solar systems shall be capable of being serviced by a trained service technician using a maintenance manual.

3. Replacement parts. Parts, components, and equipment required for service, repair or replacement shall be commercially available or available from the system or subsystem manufacturer or supplier.

4. Draining and filling of liquids. To facilitate system or subsystem maintenance and repair, subsystems employing liquids shall be capable of being filled and drained.

5. Flushing of liquid subsystems. Suitable connections shall be provided for the flushing (cleaning) of liquid energy systems and subsystems.

6. Installation, operation and maintenance manual. A manual shall be provided to the purchaser for the operation and maintenance of the solar energy system/subsystem. An installation manual shall be provided to the trained service technician for installation and repair of the solar energy system/subsystem.

a. Installation instructions. The manual shall include physical, functional and procedural instructions describing how the components of the solar energy system are to be installed. These instructions shall include descriptions of both interconnections among the system components and their connections with the facility and site.

b. Maintenance and operation instructions. The manual shall completely describe the H, HC and DHW systems, their breakdown into subsystems, their relationship to external systems and elements, their performance characteristics, and their required parts and procedures for meeting specified capabilities. The manual shall list all parts of the system, by subsystem, describing as necessary for clear understanding of operation, maintenance, repair and replacement such characteristics as shapes, dimensions, materials, weights, functions and performance characteristics. The manual shall include a tabulation of those specific performance requirements which are dependent upon specific maintenance procedures. The maintenance procedures, including ordinary, preventive and minor repairs, shall be cross-referenced for all subsystems and organized into a maintenance cycle. The manual shall fully describe operation procedures for all parts of the system including those required for implementation of specified planned changes in mode of operation. The manual shall include instructions for the inspection, treatment, and disposal of transfer fluids used in the system.

c. Maintenance plan. The maintenance manual shall include a comprehensive plan for maintaining the specified performance of the solar system for its design life. The plan shall include all the necessary ordinary maintenance, preventive maintenance and minor repair work and projections for equipment replacement.

d. Manual adjustment. If manual control adjustments are required during normal operation of the system/subsystem, the operating instructions shall enumerate the time period over which these adjustments must be made and the environmental conditions requiring such adjustments.

§ 1.16107 Standards for evaluation of solar subsystems.

A. Scope. This section contains design criteria for evaluation of perform-

ance and quality of solar subsystems. Solar subsystems shall include but not be limited to the following:

1. Collector subsystems.

2. Energy transport subsystems.

3. Storage subsystems.

4. Control subsystems.

B. Collector subsystems.

1. Transmission losses due to outgassing. Outgassing of volatiles that will reduce collector performance below specified design values shall not occur when the collector is exposed to the temperature and pressure that will occur in actual service.

2. Condensation. Condensation formed on the underside of the cover plate(s) shall not reduce its transmittance during its design life to a degree that would effect the performance as declared in Disclosure Statement form.

3. Dirt retention. The cover plate(s) under normal weather conditions shall not, with normal maintenance, collect or retain dirt to an extent that would reduce its ability to transmit sunlight to a degree that would effect the performance as declared in the Disclosure Statement form.

4. Damage by hail. Refer to 2 MCAR § 1.16106 C.1.a.(3).

C. Transport and storage subsystems.

1. Entrapped air. When liquid heat transfer fluids are used, the system shall provide suitable means for air removal.

2. Protection against blockage of fluid flow. The entire heat transport system shall be protected to prevent contamination by foreign substances that may impair the flow and quality of the heat transfer fluid to a degree that would effect the performance as declared in Disclosure Statement form. Dust and fan systems shall be protected against accumulations of deposits of dust, dirt or fungi that reduce flow and efficiency.

3. Automatic pressure and temperature relief valves for flammable or combustible fluids. The fluid transfer systems shall include a pressure relief valve. The valve and its discharge system shall not permit fluid discharge into occupied space. A holding tank shall be included in the system for collection of discharge expected from the relief valve. The pressure relief valve shall be designed based on maximum temperature criteria for abnormal operating conditions. (ΔP must be limited to comply with temperature criteria.) It shall prevent further increase in temperature and provide discharge in the same manner as the pressure relief valve. Maximum fluid temperature at which temperature relief valve shall operate:

a. 37.8°C. (100°F.) below firepoint of fluid.

4. Detection of highly toxic and flammable fluids. If heat transfer fluids that are highly toxic and/or flammable are used, means shall be provided for the detection of leaks and the warning of occupants when leaks occur.

5. System drainage. System designs incorporating automatic drainage of heat transfer fluid or storage to prevent freezing of the fluid in solar collectors shall not be constructed of materials which corrode in the presence of air or shall be suitably protected against such corrosion. Liquid systems, system components, piping or storage tanks shall be designed for complete isolation and drainage for maintenance purposes.

6. Heat transfer fluids. The heat transfer fluid shall not cause deleterious effects to those parts of the solar energy system with which it comes into contact. Except when such changes are allowed by the design of the system, the heat transfer fluid shall not freeze, give rise to excessive precipitation, otherwise lose its homogeneity, boil, change pH or undergo large changes in viscosity when exposed to its intended service temperature and pressure range.

7. Contamination. Thermal transfer system and storage materials, including any interior protective coatings and the heat storage medium used, shall not contaminate potable water nor ventilation air.

D. Control subsystems. The control subsystem shall provide for the safe and efficient operation of the solar systems/subsystems.

1. The solar energy system controls shall prevent major damage to system components in the event of power failure or other system malfunction.

2. Identification and location of controls. Main shutoff valves and switches shall be conspicuously marked and placed in readily accessible locations.

3. Bypass. The control subsystem shall include such provision for manual bypass, adjustment, or over-ride of automatic controls as is required to facilitate installation, startup, shutdown and maintenance.

APPENDIX A
Reference Standards and Test Methodology

The following standards have been exerpted from the documents referenced below. Use of these standards and tests is mandatory for evaluation of systems, subsystems, and components.

ASTM	American Society for Testing and Materials, 1916 Race St., Philadelphia, Penn. 19103
HUD	NBSIR 76-1059 Intermediate Minimum Property Standards for Solar Heating and Domestic Hot Water Systems April, 1976, 415 - 7th Street S.W., Washington, D.C. 20410
NASA	98M 10001 Interim Performance Criteria for Commercial Solar Heating and Combined Heating/Cooling Systems and Facilities February 28, 1975 National Aeronautics & Space Admin., Solar Heating & Cooling Office, Marshall Space Flt. Cntr., Huntsville, Alabama 35812
NBS	Interim Performance Criteria for Solar Heating and Combined Heating/Cooling Systems and Dwellings January 1, 1975, U.S. Dept. of Commerce, Washington, D.C. 20234
ASHRAE	93-77 "Methods of Testing to Determine the Thermal Performance of Solar Collectors", ASHRAE Circulation Sales Dept., 345 E. 47th Street, New York, NY 10017

SOLAR SYSTEM–Durability/Reliability

A. Materials compatibility.

1. Effects of decomposition products–NASA Chapter 5, Section 15

2. Material compatibility test–NASA Chapter 5, Section 13

3. Absorbtive coatings, compatibility with heat transfer medium–ASTM D-1308-57, 1973

4. Transport subsystem, materials used for transporting fluids–HUD Appendix Table B-2
   Materials/transfer fluid compatibility–ASTM D 2570-73
   NBS Appendix Section 12

5. Gaskets and sealants
   Chemical and physical compatibility–ASTM F82-67, 1973
   Deterioration of gaskets and sealants–NASA Chapter 5, Section 10

B. Effects of external environment.

1. Growth of fungi, mold or mildew
   Section 10, UL 181-74
   Method 508 MIL-STD-810

2. Solar degradation—NASA Chapter 5, Sections 01, 02, 03

3. Soil corrosion—NASA Chapter 5, Section 04

4. Airborne pollutants—NASA Chapter 5, Section 5

5. Collector subsystem
   Cover plate, UV stability—ASTM E-424-71
   Absorber plate, UV stability—ASTM D822-60, 1973
   (modification of above) HUD 515 2.4.3
   Moisture stability—ASTM D2247-68, 1973

6. Organic coupling hoses
   UV stability—ASTM D750-68, 1974
   Compatibility with heat transfer fluid—ASTM F82-67, 1973
   Ozone degradation—ASTM D1149-64, 1970

C. Temperature and pressure resistance.

1. Thermal cycling stresses—NBS Appendix, Section 08

2. Thermal degradation test—NASA Chapter 5, Appendix, Section 06

3. Leakage—NBS Appendix, Section 09

4. Absorptive coatings, thermal stability
   ASTM D660-44, 1970; D661-44, 1975; D714-56, 1974; D772-47, 1975

5. Gaskets and sealing pressurized systems test—ASTM D1081-60, 1974

COLLECTOR SUBSYSTEMS

A. Collector performance. Collector thermal performance test—NBSIR 74-635.

B. Durability and reliability of collector subsystems. Outgassing, transmission losses due to—NASA Chapter 5, Section 11.

C. Durability/reliability of transport subsystems. Deterioration of heat transfer fluids—NBS Appendix, Section 07.

APPENDIX B
Calculation Procedures—Solar Systems
NOMENCLATURE

A_c	Collector aperture area (ft^2) (M^2)
$(\dot{m}c_p)$	Min fluid capacitance [Btu/h^oF)] (Watts/^oC)
c_p	Fluid capacitance [Btu/(lb^oF)] (Joules/Kg - ^oC)
D_1, D_2	Dimensionless parameters
Δt_d	Temperature difference for building design temperature conditions (^oF)
Δt	Total number of hours in a particular month (h)
ϵ_c	Effectiveness of the collector-storage heat exchanger
ϵ_L	Effectiveness of the load heat exchanger
θ	Collector tilt (^{o})
E	Solar energy supplied for a particular month (Btu/month) (Joule/month)
E_{total}	Solar energy supplied for an entire year (Btu/year) (Joules/year)
f	Monthly fraction of total heating load supplied by solar energy
F_{annual}	Yearly fraction of the total heating load supplied by solar energy
F_R	Collector heat removal factor
F_R'	Combined form of the collector heat exchanger effectiveness and the collector heat removal factor (F_R)
γ	Solar collector azimuth angle (for due south = 180^o)
$\bar{I}_H$	Monthly average of the daily radiation incident on a horizontal surface [Btu/(day - ft^2)] (Joule/Day - M^2)
$\bar{I}_T$	Monthly average of the daily radiation incident on a tilted surface [Btu/(day - ft^2)] (Joule/Day - M^2)
$\overline{K_t}$	Ratio of the monthly averages of the daily radiation on a horizontal surface to the extraterrestrial radiation on a horizontal surface
K_1	Correction factor to correct f for various storage capacities other than 15 Btu/(^oF - ft^2) (306,620 Joule/^oC - M^2)

K_2	Correction factor to correct for $_L(mc_p)$min/UA other than 2
L	Total heating and hot water load for a particular month (Btu/month) (Joules/month)
L_{Total}	Total heating and hot water load for an entire year (Btu/year) (Joules/year)
m	Mass of domestic hot water used for a particular month (lb) (kg)
$\dot{m}$	Flow rate of the working fluid either air or liquid (lb/hr) (kg/hr)
M	Mass of thermal storage (lb) (kg)
N	Number of days in a particular month
ϕ	Latitude
Q_s	Space heating load for a particular month (Btu/month) (Joules/month)
Q_w	Domestic hot water heating load for a particular month (Btu/month) (Joules/month)
q_d	Building design rate of sensible heat loss (Btu/h) (Watts)
$\overline{R}$	Ratio of the monthly average daily radiation on a tilted surface to that on a horizontal surface
S	Monthly incident solar radiation on a tilted surface Btu/(month - ft^2) (Joules/month - M^2)
$\overline{t}_a$	Average ambient air temperature for the particular month
t_s	Temperature of domestic hot water supply (^oF) (^oC)
t_m	Temperature of water main supply (^oF) (^oC)
t_{ref}	Reference temperature, 212^oF (100^oC)
Δtime	Total number of hours in each month
$\overline{\tau\alpha}$	Average transmissivity-absorptivity product for design purposes
$(\tau\alpha)_n$	Transmissivity-absorptivity product at normal incidence
U_L	Collector heat loss factor Btu/hr - ^oF - ft^2) (Watt/^oC - M^2)
UA	Building heat loss factor Btu/(h - ^oF) (Watt/^oC)
f_n	Monthly fraction of heating load supplied by solar energy

f_c Monthly fraction of cooling load supplied by solar energy

f_o Monthly fraction of other load supplied by solar energy

P.F. Proportionality factor used to refine heat load calculations based on the 65^o degree-day method.

References Cited

1. Klein, S. A., Beckman, W. A., and J. A. Duffie, "Design Procedure for Solar Heating Systems," presented at the 1975 International Solar Energy Congress, UCLA, Los Angeles, California, July, 1975.

2. B. Y. H. Liu, R. C. Jordan, "Availability of Solar Energy for Flat-Plate Solar Heat Collectors," Low Temperature Engineering Application of Solar Energy, ASHRAE, New York, 1967.

APPENDIX B
Calculation Procedures[1]—Solar Systems

A. Performance measurements for a solar system shall be made using the following outline:

1. Calculate the monthly energy load (heating, cooling).

2. Calculate the monthly incident solar radiation on the collector array.

3. Determine the component parameters, i.e., subsystem efficiencies, capacities, required operating energies, etc.

4. Calculate the monthly fraction of load supplied by solar system.

5. With the monthly loads and monthly fractions supplied by solar, calculate the annual fraction of load supplied by solar energy less solar system operating energy.

B. Specifically, performance measurements for different solar systems shall be made as follows:

1. Combined collector and storage devices. The system thermal performance is determined by the short term (1 to 3 days) collection and storage of thermal energy obtained from solar radiation and the amount of useful energy delivered to the load from storage for part and full load conditions. Experimental performance data, in terms of heat collected and stored or delivered to load, shall be provided for the design conditions including solar power density, heat transfer fluid temperature, ambient temperature, wind, solar radiation incident angle, and flow rates. The daily and average test period electrical operating requirements shall be reported with system performance.

2. Passive (integral) solar systems. The thermal performance of an integral solar system shall be obtained from a detailed simulation analysis of the climate, building thermal properties and occupancy thermal influence.

3. Active solar systems. Where applicable, collector based solar systems shall use the calculation procedures outlined in paragraph C. below. When different procedures are used due to an incompatibility between the system (or subsystem) under study and the outlined procedures, the elected calculation procedure shall be representative of realistic demand, solar radiation, component capacities, efficiencies, required operating energies, etc.

C. Determining monthly load. The monthly load is comprised of heating, cooling, and other service loads that might be offset by the solar system.

1. Klein, S. A., Beckman, W. A., and J. A. Duffie, "Design Procedure for Solar Heating Systems," presented at the 1975 International Solar Energy Congress, UCLA, Los Angeles, California, July, 1975.

1. Total heating load. The total heating load is determined on a monthly basis for both space and hot water heating. The space and hot water heating loads are calculated separately and for combined systems, the monthly individual loads are added to get a monthly total load.

a. Hot water load. Determine the required volume of domestic hot water (gal) required on a monthly basis. Then, knowing the volume, calculate the mass (m) using a value of 8.33 lb/gal (119.8 kg/M^3). Determine the water main temperature (t_m) or assume $t_m = 55^oF.$ (12.8°C). Calculate the monthly domestic hot water heating load using the following equation:

$$Q_w = \left[\frac{\text{(lb or kg) DHW consumed}}{\text{(Month)}}\right]\left[\text{Specific Heat of Water } \frac{\text{Joule}}{\text{(kg-}^oC)}\right]\left[\text{Temp. Supply} - \text{Temp. Water Main}\right]$$

For situations where the domestic hot water requirements cannot be reasonably estimated, a load of 1.6×10^6 Btu/month may be assumed for a typical residence. This is equivalent to approximately 90 gallons of hot water use per day.

b. Space heating load. The space heating load for each month shall be calculated using the degree-day method. A P.F. value of 0.75 shall be used unless practical experience in the locality dictates the use of a different value.

(1) To calculate space heating load. Building heat loss shall be calculated according to methods described in the ASHRAE Handbook of Fundamentals or other recognized means. The loss calculations shall include:

Heat loss by transmission:

Q_{st} U A $(t_i - t_o)$

Heat loss by infiltration - use (a) or (b):

(a) Air change method

(b) Crack method

In either case, $Q_{si} = .018$ V $(t_i - t_o)$

(2) Obtain the monthly total degree days from the ASHRAE Systems Handbook for the particular location for each month.

(3) Add infiltration and transmission losses to obtain design total instantaneous loss. $Q_s = Q_{st} + Q_{si}$

(4) Obtain BTU's per degree day for month.

$$\frac{\text{P.F.} \times Q_s \times 24}{t_i - t_o} = \text{Btu/DD}$$

Q_s = Heat flow rate, BTU/Hr.

U = Heat transfer coefficient, BTU/(hr) (ft^2) (F^o)

A = Area of transfer surface, ft^2

t_i = Design indoor temperature, ^oF

t_o = Design outdoor temperature,

P.F. = Proportionality factor

V = Volume of air (c.f. per hour)

D.D. = Degree day

2. Calculation of cooling and other loads. Calculations of cooling loads and/or other loads that might be offset by the solar system shall be according to the ASHRAE Handbook of Fundamentals or other recognized means.

3. Table A is included for tabulating loads.

D. Determining the monthly incident solar radiation. Table B is included for tabulating the incident solar radiation calculation.

1. Monthly average of the daily radiation incident on a horizontal surface, I_H. For locations near St. Cloud, I_H shall be taken from Table 4A. For other locations, alternate means of determining I_H, such as interpolation from radiation maps, may be used.

2. Ratio of the monthly averages of the daily radiation on a horizontal surface to the extreterrestrial radiation, (K_t). For locations near St. Cloud, K_t shall be taken from Table 4A. For other locations, alternate means may be used.[1] [2]

3. Ratio of the monthly average daily radiation on a tilted surface to that on a horizontal surface for collectors facing due south (R). Using Table 4B and knowing collector tilt (Θ), latitude (ϕ), and K_t, determine R for each month. K_t may be interpolated.

4. Monthly average daily radiation on a tilted surface, (L_T). Knowing I_H and R for each month, calculate I_T on a monthly basis using the equation: $I_T = (I_H)(R)$

[1] Donald G. Baker and John C. Klink, Solar Radiation Reception, Probabilities and Areal Distribution in the North-Central Region, Agricultural Experiment Station, University of Minnesota, Technical Bulletin 300 (1975).

[2] Donald G. Baker, Climate of Minnesota Part VI Solar Radiation at St. Paul, Agricultural Experiment Station, University of Minnesota, Technical Bulletin 280 (1971).

TABLE 4-A

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
St. Cloud, MN	I_H	632.8	976.7	1383	1598.1	1859.4	2003.3	2087.8	1828.4	1369.4	890.4	545.4	483.1
Lat. 45°35'N	K_t	0.595	0.629	0.614	0.534	0.530	0.533	0.573	0.570	0.539	0.490	0.435	0.504
El. 1034 ft.	t_q	13.6	16.9	29.8	46.2	58.8	68.5	74.4	71.9	62.5	50.2	32.1	18.3

Values from "A Rational Procedure for Predicting a Long Term Average Performance of Flat Plate Collectors." Solar Energy, 17, No. 2, 1963. B.Y.H. Liu, R. C. Jordan.

5. Total monthly radiation on a tilted surface, (S). (I_T, the monthly average daily radiation on a tilted surface, must be multiplied by the total days in each month, (N) to obtain total insolation for each month.
$S = (I_T)(N)$.

6. Shading. Shading should not be neglected in calculating the incident solar radiation on a particular collector array. The amount of shading is strongly dependent on the collector site and orientation; thus, each case must be analyzed separately.

E. Predicting system performance. This procedure does not apply to passive systems or to active systems that do not generally conform to the configuration of Figure 5A or 5B as appropriate. The procedure cannot be used for systems in latitudes farther north than sixty degrees. The procedure is intended to evaluate long-term performance of most solar heating systems using a simple desk calculator or slide rule. Since in most instances flat plate collectors are utilized for heating buildings, the collector component parameters are only valid for modeling flat plate collectors. Concentrating collectors or evacuated tubular collectors cannot be incorporated into the solar heating system evaluation as it is presently written in this Appendix. The system evaluation procedure as outlined in this Appendix can only accurately predict system performance for systems using south facing collector arrays. Cases of different collector orientations must be analyzed using a different procedure.

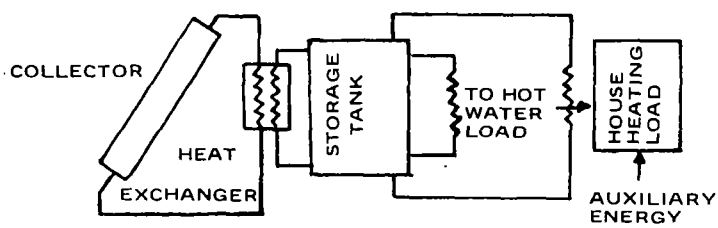


Figure 5-A. Liquid System

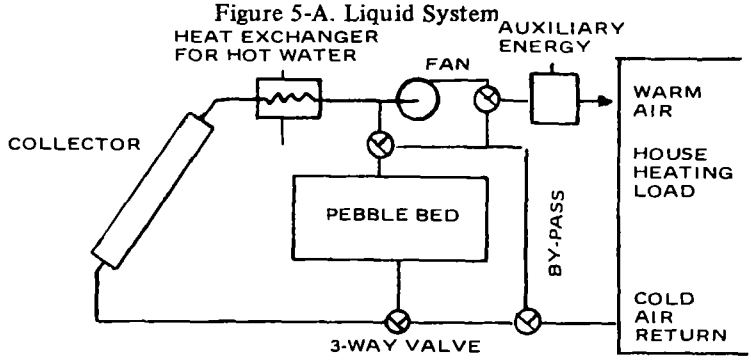


Figure 5-B. Air System

TABLE 4-B

R for $K_T = .40$

LATITUDE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					(Latitude - Tilt) = 15.0							
40	1.44	1.35	1.17	1.06	.99	.97	.98	1.03	1.12	1.27	1.39	1.51
45	1.68	1.40	1.24	1.09	1.00	.97	.98	1.05	1.17	1.39	1.58	1.85
50	1.90	1.58	1.32	1.12	1.01	.97	.99	1.06	1.23	1.46	1.92	2.11
					(Latitude - Tilt) = .0							
40	1.61	1.45	1.19	1.03	.93	.89	.91	.98	1.12	1.34	1.53	1.70
45	1.88	1.49	1.26	1.05	.93	.89	.91	.99	1.16	1.47	1.75	2.12
50	2.13	1.69	1.35	1.08	.94	.88	.90	1.01	1.22	1.54	2.14	2.40
					(Latitude - Tilt) = -15.0							
40	1.68	1.48	1.15	.95	.83	.78	.80	.89	1.06	1.34	1.58	1.80
45	1.98	1.51	1.22	.96	.83	.77	.80	.90	1.10	1.47	1.82	2.27
50	2.24	1.72	1.30	.99	.83	.76	.79	.91	1.16	1.53	2.24	2.56
					Vertical							
40	1.51	1.25	.86	.61	.48	.44	.46	.55	.75	1.08	1.39	1.65
45	1.84	1.30	.96	.67	.53	.48	.50	.60	.83	1.25	1.66	2.17
50	2.13	1.54	1.08	.74	.58	.52	.54	.66	.93	1.34	2.12	2.47

TABLE 4-B

R for $K_T = .50$

LATITUDE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					(Latitude - Tilt) = 15.0							
40	2.53	1.40	1.20	1.08	1.00	.97	.98	1.04	1.14	1.32	1.46	1.60
45	1.80	1.47	1.28	1.11	1.08	.97	.98	1.06	1.20	1.45	1.69	1.99
50	2.06	1.68	1.38	1.14	1.02	.97	.99	1.08	1.27	1.54	2.08	2.30
					(Latitude - Tilt) = .0							
40	1.72	1.53	1.24	1.04	.93	.88	.90	.99	1.15	1.41	1.63	1.83
45	2.05	1.59	1.32	1.07	.93	.88	.90	1.01	1.20	1.56	1.89	2.31
50	2.34	1.83	1.42	1.10	.94	.88	.91	1.03	1.28	1.64	2.35	2.65
					(Latitude - Tilt) = -15.0							
40	1.82	1.58	1.20	.96	.82	.77	.79	.90	1.10	1.42	1.71	1.96
45	2.18	1.62	1.28	.98	.83	.76	.79	.91	1.15	1.57	1.99	2.50
50	2.48	1.87	1.38	1.01	.83	.76	.79	.93	1.21	1.65	2.48	2.84
					Vertical							
40	1.66	1.35	.90	.61	.46	.41	.43	.54	.77	1.16	1.51	1.83
45	2.05	1.42	1.01	.68	.52	.45	.48	.60	.86	1.35	1.83	2.42
50	2.37	1.70	1.16	.76	.57	.50	.53	.67	.97	1.46	2.37	2.77

TABLE 4-B

R for $K_T = .60$

LATITUDE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					(Latitude - Tilt) = 15.0							
40	1.60	1.46	1.23	1.09	1.00	.96	.98	1.05	1.17	1.37	1.53	1.68
45	1.92	1.54	1.32	1.12	1.01	.97	.99	1.07	1.23	1.52	1.79	2.13
50	2.22	1.79	1.44	1.17	1.03	.97	.99	1.10	1.32	1.63	2.24	2.49
					(Latitude - Tilt) = 0							
40	1.84	1.61	1.28	1.06	.93	.88	.90	1.00	1.18	1.47	1.73	1.96
45	2.21	1.69	1.37	1.09	.94	.88	.90	1.02	1.25	1.65	2.03	2.50
50	2.54	1.96	1.50	1.13	.95	.88	.91	1.05	1.33	1.75	2.55	2.90
					(Latitude - Tilt) = -15.0							
40	1.96	1.68	1.25	.98	.82	.76	.78	.90	1.13	1.50	1.83	2.12
45	2.37	1.73	1.34	1.01	.83	.75	.78	.92	1.19	1.68	2.16	2.73
50	2.71	2.07	1.46	1.04	.83	.75	.79	.94	1.27	1.77	2.72	3.13
					Vertical							
40	1.81	1.45	.94	.61	.44	.38	.40	.53	.79	1.23	1.64	2.00
45	2.26	1.53	1.07	.69	.50	.43	.46	.60	.90	1.45	2.01	2.66
50	2.62	1.85	1.23	.78	.56		.52	.67	1.02	1.58	2.61	3.07

TABLE 4-B

R for $K_T = .70$

LATITUDE	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
					(Latitude - Tilt) = 15.0							
40	1.66	1.50	1.26	1.10	1.00	.96	.98	1.05	1.19	1.40	1.58	1.75
45	2.01	1.60	1.36	1.14	1.02	.97	.99	1.08	1.26	1.57	1.87	2.23
50	2.34	1.87	1.49	1.19	1.03	.97	1.00	1.11	1.35	1.69	2.36	2.63
					(Latitude - Tilt) = .0							
40	1.92	1.68	1.31	1.07	.93	.57	.89	1.00	1.21	1.52	1.80	2.06
45	2.34	1.76	1.42	1.11	.94	.67	.90	1.03	1.28	1.71	2.14	2.65
50	2.70	2.07	1.55	1.16	.95	.68	.91	1.06	1.37	1.83	2.71	3.09
					(Latitude - Tilt) = -15.0							
40	2.07	1.75	1.29	.99	.81	.75	.78	.91	1.16	1.56	1.92	2.25
45	2.52	1.82	1.39	1.02	.83	.75	.78	.93	1.23	1.75	2.28	2.90
50	2.89	2.14	1.53	1.07	.84	.75	.79	.96	1.32	1.87	2.90	3.35
					Vertical							
40	1.92	1.52	.97	.61	.42	.36	.39	.52	.81	1.29	1.74	2.13
45	2.42	1.61	1.11	.70	.49	.41	.45	.59	.93	1.53	2.14	2.85
50	2.81	1.96	1.29	.79	.55	.47	.51	.68	1.06	1.47	2.80	3.30

Component parameters. The component parameters characterize the various components that make up the system. In cases of design where several different solar heating systems may be considered for the same location and collector tilt, incident radiation on a tilted surface (I_T) need only be calculated once. In such a case, only the values of the component parameters need to be adjusted for the different systems.

Solar collector. Using collector thermal performance efficiency curves provided by the manufacturer (as determined by test in accordance with NBSIR 74-635) range of operational temperature, insolation, tilt angles and flow rates determine the collector parameters $F_R U_L$ and $F_R(\tau\alpha)$. The thermal efficiency collector curve must be plotted such that the y-axis is the thermal efficiency (η) and the x axis, the temperature difference between the collector fluid inlet and the ambient air divided by the incident solar radiation ($t_i - t_a/I_T$). The thermal efficiency is the ratio of useful output thermal energy to the incident solar energy on the collector aperture area. To determine $F_R U_L$ calculate the slope of a linear curve fit for the efficiency curve. The y-axis intercept is equal to $F_R(\tau\alpha)$.

Collector-Storage heat exchanger. To simplify the number of input parameters, the collector-storage heat exchanger effectiveness $_c$, and the collector heat removal factor, F_R, can be combined in a single parameter F_R'. Determine F_R'/F_R by the following equation, or the graphical representation in Figure 5-D.

$$\frac{F_R'}{F_R} = \frac{1}{1 + \left[\frac{F_R U_L A_C}{(\dot{m}\, c_p)_c}\right]\left[\frac{(m\, c_p)_c}{\epsilon_c (\dot{m}\, c_p)_{min}} - 1\right]}$$

where A_c = aperture area of the collector array

$(m\, c_p)_{min}$ = minimum fluid capacitance rate of the working fluids across the collector-storage heat exchanger.

$(m\, c_p)_c$ = fluid capacitance rate of the collector working fluid.

ϵ_c = effectiveness of the collector heat exchanger

$$= \frac{\text{actual heat transfer}}{\text{maximum possible heat transfer}}$$

The water-to-water collector storage heat exchanger effectiveness (ϵ_c) is easily calculated from methods given in the ASHRAE Handbook of Fundamentals or from data supplied by the manufacturer.

Note: In systems that do not use a collector to storage heat exchanger, the ratio of F_R' to F_R is equal to 1.

$$\frac{F_R'}{F_R} = 1$$

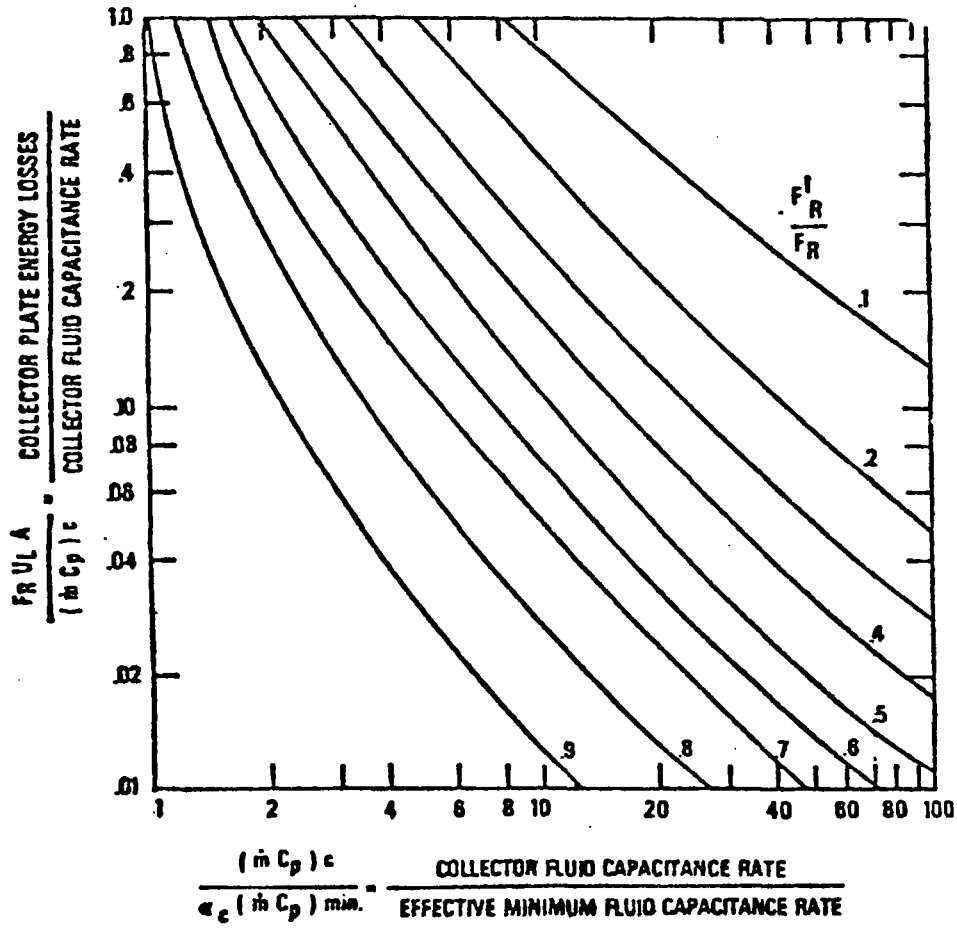


Figure 5-D. F_R'/F_R as a function of $F_R U_L A/(\dot{m} C_P)_c$ and $(\dot{m} C_P)_c/ \epsilon_L (\dot{m} E_P)_{min}$.

Storage. In general for solar heating systems utilizing water or air as heat transfer fluids an average storage capacity of 15 Btu/^{o}F per square foot of collector has been determined as near economic optimum. For storage capacities other than 15 a correction factor will be introduced later to correct the value of the predicted system thermal performance.

Load heat exchanger. Determining from the manufacturer's specifications the load heat exchanger effectiveness (ϵ_L) and calculate minimum fluid capacitance $(\dot{m}c_p)_{min}$ rate across the exchanger. Where ϵ_L is not provided, values can be determined using procedures in the ASHRAE Handbook of Fundamentals.

Note: Since a load heat exchanger is not usually incorporated into a system using air collectors and air as the transport medium, the load heat exchanger effectiveness may be assumed equal to 1.

Dimensionless parameters (D_1, D_2). The dimensionless parameters D_1 and D_2 characterize the entire solar heating system thermal effectiveness. Calculate the two dimensionless parameters for each month using the factors defined previously on a monthly basis according to the following equations:

$$D_1 = \frac{\text{energy absorbed by collector plate}}{\text{total heating load}} = \left[A_c\right]\left[F_R(\alpha)_n\right]\left[\frac{(\overline{\tau\alpha})}{(\tau\alpha)_n}\right]\left[\frac{F_R'}{F_R}\right]\frac{S}{L}$$

$$D_2 = \frac{\text{ref. collector plate energy losses}}{\text{total heating load}} = \left[A_c\right]\left[F_R U_L\right]\left[\frac{F_R'}{F_R}\right]\left[t_{ref} - \overline{t_a}\right]\frac{\Delta \text{ time}}{L}$$

t_{ref} = 212^{o}F (arbitrarily chosen reference temperature)

$\overline{t_a}$ = average ambient air temperature for the particular month.

Δ time = total number of hours in each month

$\left[\frac{\overline{\tau\alpha}}{(\tau\alpha)_n}\right]$ = 0.90 to account for the change in the value of the effective transmission-absorption product with incident angle throughout a day.

Monthly Fraction of Total Heating Load Supplied by Solar Energy (f_n). The fraction of the heating load supplied by solar energy (f_n) can be determined from Figure as a function of the dimensionless parameters, D_1 and D_2. Locate the two dimensionless parameters on Figures 5-D and 5-E and determine the fraction of total heating load supplied by solar energy (f_n) on a monthly basis.

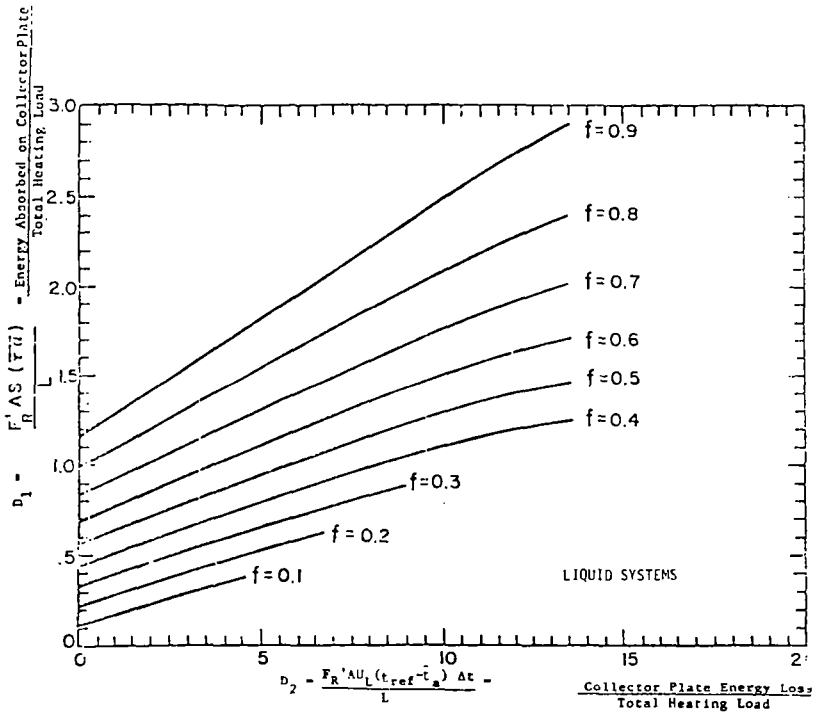


Figure 5-D. (Liquid systems) Relationship between solar fraction and dimensionless parameters D_1 and D_2.

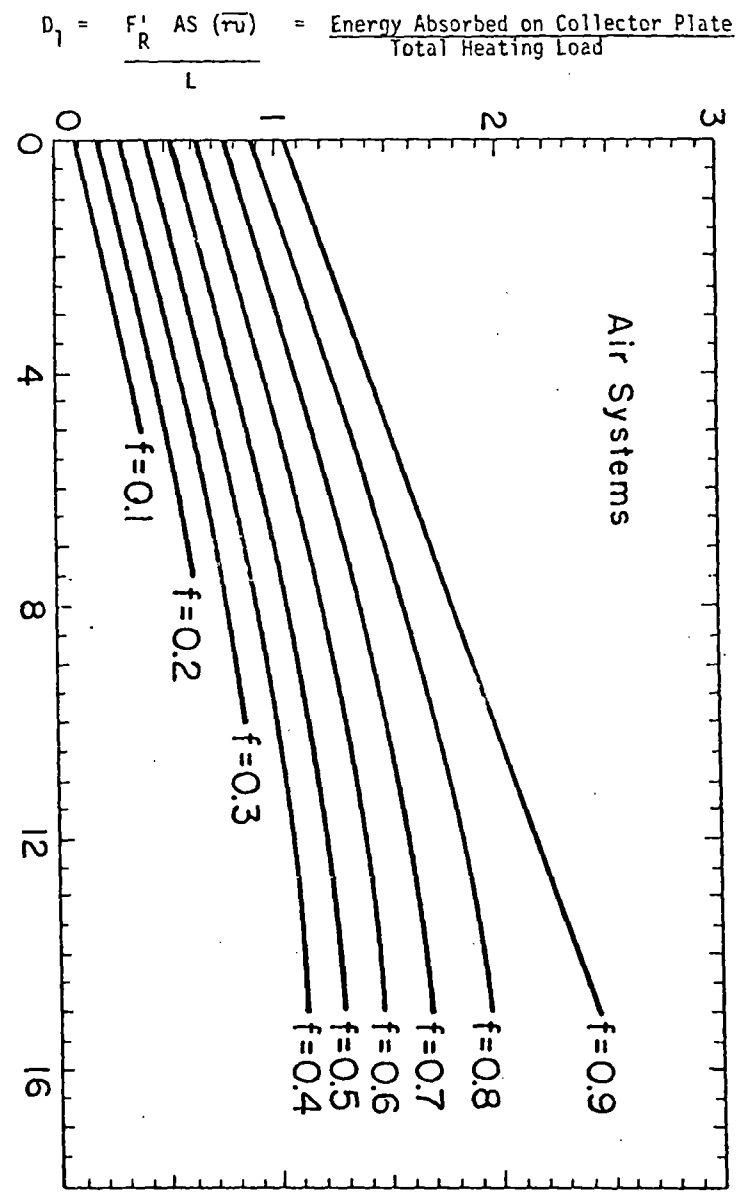


Figure 5-E. (Air Systems) Relationship between solar fraction and dimensionless parameters D_1 and D_2.

Annual fraction of the total heating load supplied by solar energy (F_{annual}). It was mentioned earlier that the procedure was intended to only provide an estimate of system performance for a particular month but a relatively good estimate for long-term performance (yearly basis). In order to calculate f on a yearly basis, the following calculations must be performed. Table C has been included for tabulating and calculating f on a yearly basis.

A. The actual solar energy supplied for each month must be calculated as follows:

$$E_{Jan} = f_{Jan} L_{Jan}$$

$$E_{Feb} = f_{Feb} L_{Feb}$$

$$E_{Dec} = f_{Dec} L_{Dec}$$

Total the solar energy supplied for the entire year by summing the contributions from each month.

$$E_{Total} = E_{Jan} + E_{Feb} \cdots E_{Dec}$$

B. Calculate the amount of operating energy required by the solar system, using standard engineering methods.

C. Calculate the total heating load for the entire year (L_{Total})

D. Knowing the total annual solar energy supplied by the heating system (E_{total}) and the total annual heating load (L_{Total}), determine F_{annual} for the entire year from the following equation:

$$F_{annual} = \frac{E_{total} - \text{operating energy}}{L_{total}}$$

E. Correction factors for F_{annual}

1. To correct for various storage capacities other than 15 Btu/^{o}F $\cdot$ ft^2), use Figure 5-F to obtain the correction factor (K_1).

2. For cases where $_{L}(mc_p)$ min/UA is other than 2, use Figure 5-G to obtain the correction factor (K_2).

3. Utilizing the correction factors K_1 and K_2, the corrected and final value of F_{annual} may be calculated as follows:

$$F'_{annual} = (K_1)(K_2)F_{annual}$$

F. Calculation of fraction of cooling and other loads supplied by solar energy (f_c), (f_o). Calculation of cooling and other solar contribution shall be determined in a manner similar to the process described for calculation of heating contribution.

1. Calculate cooling and/or other loads.

2. Apply the following parameters in the same manner as in Sections D and E.

a. Monthly incident solar radiation

b. Component parameters

3. Calculate the monthly fraction of load (less operating energy) supplied by solar system.

4. Calculate the annual fraction of load supplied by solar energy. Calculations shall be performed with the same degree of accuracy and with the same completeness, as those for determining solar heating contribution. Tables similar to A, B and C may be used for data presentation.

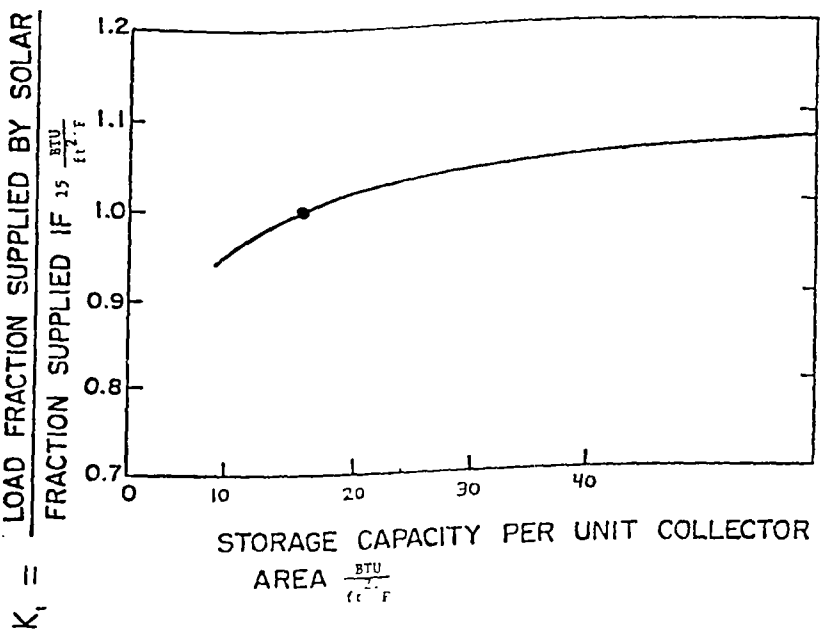


Figure 5-F. Correction factor (K_1) for storage capacities other than 15 BTU/ ft^2 °F.

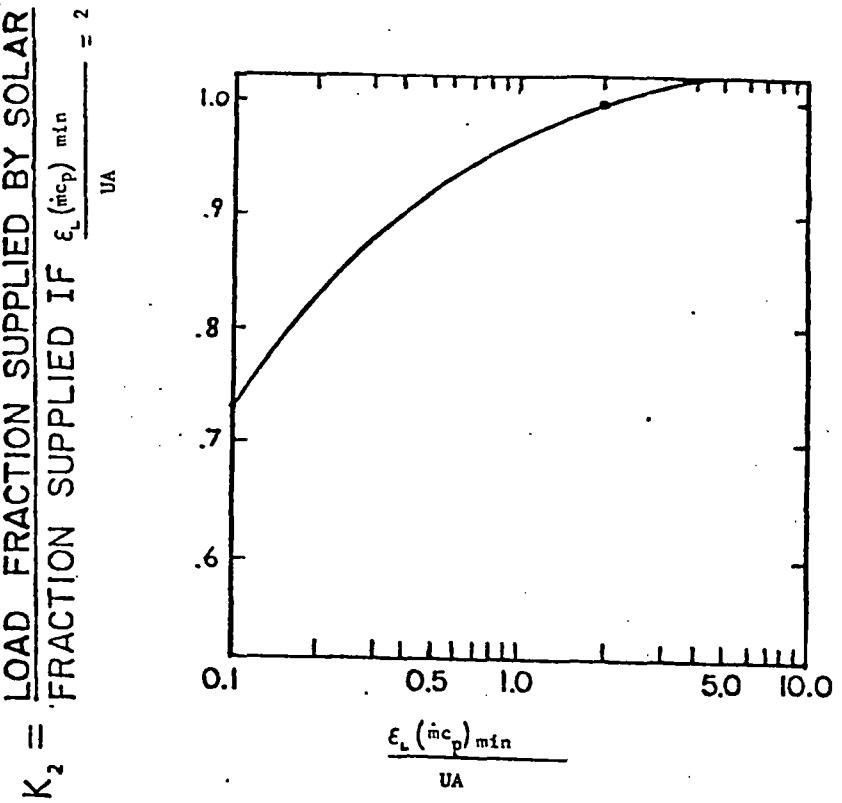


Figure 5-G. Correction factor (K_2) for various values of $L(mc_p)_{min}/UA$.

TABLE A. DOMESTIC HOT WATER

SPACE HEATING LOAD

	DEGREE DAYS	BTU / MONTH Qs
Jan.		
Feb.		
Mar.		
April		
May		
June		
July		
Aug.		
Sept.		
Oct.		
Nov.		
Dec.		

q_d = _____ BTU/h

ΔT_d = _____ (°F)

UA = _____ BTU/h F

HEATING LOAD

	DHW / MONTH m* Cal/lbm	BTU / MONTH Qw
Jan.		
Feb.		
Mar.		
April		
May		
June		
July		
Aug.		
Sept.		
Oct.		
Nov.		
Dec.		

*1 gal = 8.3 lbm

t_s = _____ °F

t_m = _____ °F

TOTAL HEATING LOAD

	BTU / MONTH L = Qs + Qw	$\overline{t_a}$ (°F) Ambient Air Temperature
Jan.		
Feb.		
Mar.		
April		
May		
June		
July		
Aug.		
Sept.		
Oct.		
Nov.		
Dec.		

TABLE B

Component Parameters

Incident Solar Radiation

	BTU Day ft^2 I_H		K_t	R	BTU Day ft^2 $I_T = I_H R$	BTU Month ft^2 S
Jan.						
Feb.						
Mar.						
April						
May						
June						
July						
Aug.						
Sept.						
Oct.						
Nov.						
Dec.						

latitude= ___

tilt = ___

I. Collectors

$F_R U_L$ = m =

$F_R(\tau\alpha)_n$ = c_p =

II. Collector-Storage Heat Exchanger

F_R'/F_R = $\frac{(F_R U_L)A_c}{(m\ c_p)_c}$ =

ϵ_c = $\frac{(m\ c_p)_c}{\epsilon_c (mc_p)_{min}}$ =

III. Storage

M = $c_p M/A_c$ =

IV. Load Heat Exchanger

ϵ_L = $\frac{\epsilon_L (mc_p)_{min}}{UA}$ =

$(m\ c_p)_{min}$ =

TABLE C

DIMENSIONLESS PARAMETERS

	BTU Month L	BTU Month ft^2 S	HRS Month t	^oF t_a	D_1	D_2
Jan.			744			
Feb.			696			
Mar.			744			
April			720			
May			744			
June			720			
July			744			
Aug.			744			
Sept.			720			
Oct.			744			
Nov.			720			
Dec.			744			

FRACTION OF THE TOTAL HEATING LOAD SUPPLIED BY SOLAR ENERGY

f	BTU Month E

E total = _____

L total = _____

F annual = $\frac{\text{E total}}{\text{L annual}}$

= _____

K_1 = _____

K_2 = _____

F'annual = $(K_1)(K_2)$ F annual

= _____

Repealed 7 SR 925 12-13-82

2 MCAR S 1.16201 Authority. These rules are promulgated pursuant to Minnesota Statutes, section 116H.129 (1978) and (1979 Supplement).

2 MCAR S 1.16202 Enforcement. The Minnesota Energy Agency shall conduct random inspections of certain renter occupied residences as provided in Minnesota Statutes, section 116H.129, subdivisions 3 and 4 (1978).

2 MCAR S 1.16203 Purpose and scope. The purpose of these rules is to establish minimum energy efficiency standards for existing residences. Such standards shall be utilized in the energy disclosure program required by Minnesota Statutes, section 116H.129, subdivisions 5, 6, and 7 (1978), and shall be applicable to certain rental residences as provided in Minnesota Statutes, section 116H.129, subdivisions 3 and 4 (1978).

The scope of these standards addresses two areas of energy savings:

A. The reduction of air infiltration as it relates to air leakage through the exterior envelope.

CAUTION: When infiltration is reduced it may be necessary to provide combustion air by other means as provided for in the Minnesota State Building Code.

B. The improvement of the thermal efficiency of the structure as it relates to the transfer of heat through the exterior envelope.

The rules also contain the methods for calculating energy savings and determining the economic feasibility of each minimum energy efficiency standard for each residence.

2 MCAR S 1.16204 Definitions.

A. Accessible. Shall mean exposed, without the removal of permanent parts of the structure.

B. Attic. The space between the ceiling joists and the rafters immediately above. The space between rafters formed where interior finish material is affixed directly to the rafters shall not be construed to be an attic space.

C. Conditioned space. Space enclosed within a building that is heated or cooled by an energy-using system.

D. Degree day. Shall mean degree day, heating. A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day, when the mean temperature

is less than 65°F (18°C) there exist as many degree days as there are Fahrenheit (Celsius) degrees difference in temperature between the mean temperature for the day and 65°F (18°C).

E. Economic feasibility. For the purpose of these rules, the test of economic feasibility is met when the savings in energy procurement costs, based on residential energy costs as certified by the Minnesota Energy Agency director in the State Register, exceed the cost of acquiring and installing each energy conserving item required to meet the minimum energy conservation standards as set forth at 2 MCAR § 1.16205, amortized over the subsequent ten-year period.

F. Exterior envelope. The elements of a building which enclose conditioned spaces and through which thermal energy may be transferred to or from the exterior.

G. Floor insulation. A material as described in definition I which is installed between the first level conditioned area of a building and an unconditioned basement, a crawl space or the outside beneath it.

H. Fireplace stove. A chimney-connected, solid fuel-burning stove having part of its fire chamber open to the room.

I. Insulation. Any material or assembly of materials used primarily to provide resistance to heat flow in building structures, including but not limited to mineral fibrous, mineral cellular, organic fibrous, organic cellular, or reflective materials, whether in loose fill, flexible, or semi-rigid form.

J. Positive shut-off. A manual shut-off device which can be utilized to produce a seal to inhibit the flow of air when a fireplace or fireplace stove is not operating, i.e., damper in fireplace, damper at top of flue, damper in connector pipe, or doors (glass or other) on fireplace or fireplace stove.

K. "R" value. The measure of resistance to heat flow through a material or the reciprocal of the heat flow through a material expressed in British thermal units per hour per square foot per degree Fahrenheit at 75 degrees Fahrenheit (24°C) mean temperature.

L. Residence. Means any dwelling for habitation either seasonally, meaning all or a portion of the months of December through March, or permanently by one or more persons. A residence may be owned or rented and may be part of a multi-family dwelling or multi-purpose building, but shall not include buildings such as hotels, hospitals, motels, dormitories, sanitariums, nursing homes, schools and other buildings used for educational purposes, or correctional institutions. A mobile home as defined in Minnesota Statutes, section 168.011, subdivision 8, shall be a residence for purposes of these rules.

M. Rim joist. That portion of the exterior envelope between the top of the foundation wall and the sub-floor immediately above. The perimeter of the floor joists.

N. Seasonal operating efficiency shall mean the quotient obtained by dividing the useful energy provided by a system to the residence during the entire season divided by the heating value of the fuel used. The useful heat provided by combustion heating system to the residence shall include subtractions for heat lost due to air infiltration induced by any vents, draft hoods or barometric dampers attached to the system.

O. Single glazed. Windows with one sheet of glazing separating the conditioned space from the exterior. For the purposes of these rules non-conditioned enclosed porches, vestibules, or other appurtenances are considered the equivalent of one layer of glazing.

P. Storm door. Shall mean a second door, installed outside or inside a primary door, creating an insulating air space.

Q. Storm Window. Shall mean a window or glazing material placed outside or inside of a window sash (prime window) creating an air space, to provide greater resistance to heat flow than the glazed window sash alone.

R. U-value (U-factor or U = thermal transmittance). The thermal transmission of heat in unit time through unit area of a particular body or assembly, including its boundary films divided by the difference between the environmental temperatures on either side of the body or assembly; Btu/(hr.ft^{2}F$^\circ$). Also the reciprocal of total R-value.

S. Weatherstripping. Material permanently affixed to limit infiltration of air, usually made of metal, wood, felt, neoprene, expanded foam, or a combination thereof.

Repealed 10 SR 925 12-13-82

2 MCAR S 1.16205 Minimum energy efficiency standards.

A. Where demonstrated to be economically feasible pursuant to 2 MCAR S 1.16206, 2 MCAR S 1.16207, and 2 MCAR S 1.16208 the following shall be standards for existing residences. Pursuant to Minnesota Statutes, section 116H.129, subdivisions 3 and 5 (1978) residential rental buildings built before January 1, 1976, which are not in compliance with these standards shall be modified to be in compliance within the economic feasibility defined in 2 MCAR S 1.16204 by January 1, 1980 with respect to caulking and weatherstripping and by July 1, 1983 with respect to all provisions herein. These standards shall also provide a basis for evaluation of residences at time of sale.

1. Install weatherstripping between exterior operable window sash and frames and between exterior doors and frames.

EXCEPTION: Weatherstripping not required on storm doors or

storm windows.

2. Caulk, gasket or otherwise seal accessible exterior joints between foundation and rim joist, around window and door frames, between wall and roof, between wall panels, at penetrations for utility services through walls, floors, and roofs and all other openings in the exterior envelope.

3. Install positive shut-offs for all fireplaces or fireplace stoves.

4. Install insulation in accessible attics to achieve a minimum total "R" value of 19.

5. Install insulation in all accessible rim joist areas to achieve a minimum total "R" value of 11.

6. Install insulation in accessible walls and/or floors enclosing conditioned spaces to achieve a minimum total "R" value of 11. Accessible walls shall include above-grade foundation walls of basements, cellars or crawl spaces.

7. Install storm windows and/or thermal windows on all single glazed exterior window units enclosing conditioned space.

8. Install storm doors and/or thermal doors on all exterior door openings into conditioned spaces unless a single door, enclosed porch, vestibule, or other appurtenance provides a double door effect or provides an "R" value of two or more.

2 MCAR S 1.16206 Procedures for calculating energy savings and determining economic feasibility. The calculation of the energy savings and the determination of the economic feasibility for each of the minimum energy efficiency standards shall be computed in a manner specific to each residence, i.e., on a case by case basis. Equal interest and inflation factors are assumed. This determination shall be performed according to the following procedures.

A. Determine the values of the general energy savings equation (2 MCAR S 1.16207) which are specific to each residence. These values include degree days, heating system efficiency and the heating value of the fuel but do not include the design heat loss per degree Fahrenheit (ΔH).

B. Calculate design heat per degree Fahrenheit (ΔH) for the standard under consideration using the equations outlined in 2 MCAR S 1.16207 A. through 2 MCAR S 1.16207 H.

C. Calculate the quantity of annual energy savings for the standard under consideration by substituting the calculated value of ΔH into the general energy savings equation and solving for energy savings (ΔE).

D. Determine the price per unit of energy (P) for the annual

energy savings quantity.

E. Determine the cost of the energy saving improvement (C) proposed to meet the standard under consideration.

F. Calculate the payback period (T) for the standard under consideration by substituting the values of P, C and ΔE into the general payback equation (2 MCAR S 1.16208) and solving for the payback period in years.

G. If the payback period is less than ten years the energy saving improvement meets the economic feasibility requirement.

H. Repeat the above procedure for each of the energy efficiency standards.

2 MCAR S 1.16207 General energy savings equations. The following equations shall be used to calculate energy savings for each of the energy efficiency standards.

Equation A*:

$$\Delta E = \Delta H \times \frac{D \times 20.4}{N \times V}$$

Where:

ΔE = The quantity of annual energy savings in the appropriate energy units, e.g., hundreds of cubic feet of natural gas, gallons of fuel oil, or kilowatt hours of electricity.

ΔH = The difference in design heat loss per degree Fahrenheit between the improved condition and the existing condition for infiltration and/or thermal transmission. Equations for calculating ΔH are listed in subsequent subsections.

D = The normalized annual degree days as published by the National Oceanic and Atmospheric Administration (NOAA).

N = The seasonal operating efficiency of the heating system.

V = The heating value of the fuel type, consistent with ΔE and ΔH.

*Equation (A) is derived from the ASHRAE Handbook, 1976 Systems, pp. 43.1 - 43.18.

A. Install window and door weatherstripping. The following equation shall be used to calculate ΔH for energy efficiency standard 1 (2 MCAR S 1.16205 A.).

Equation No. 1:

$\Delta H = 1.08 \times (q_0 - q_1) \times L$

Where:

q_0 = The infiltration value in cubic feet per minute per lineal foot of crack, $\frac{CFM}{ft.}$, for the existing window or door weatherstripping condition before improvement;

q_1 = The infiltration value in cubic feet per minute per lineal foot of crack, $\frac{CFM}{ft.}$, for the proposed window or door weatherstripping condition after improvement;

L = The length of the crack in feet which is under consideration for weatherstripping.

B. Caulk, gasket or seal joints. The following equation shall be used to calculate ΔH for energy efficiency standard 2 (2 MCAR S 1.16205 A.).

Equation No. 2:

$\Delta H = 1.08 \times (q_0 - q_1) \times L$

Where:

q_0 = The infiltration value in cubic feet per minute per lineal foot of crack, $\frac{CFM}{ft.}$, for the existing crack before improvement;

q_1 = The infiltration value in cubic feet per minute per lineal foot of crack, $\frac{CFM}{ft.}$, for the proposed crack seal after improvement;

L = The crack length in feet for the crack under consideration.

C. Install positive shut-offs. The following equation shall be used to calculate ΔH for energy efficiency standard 3 (2 MCAR S 1.16205 A.).

Equation No. 3:

$\Delta H = 1.08 \times (q_0 - q_1) \times A$

Where:

q_0 = The infiltration value in cubic feet per minute per square foot, $\frac{CFM}{(ft.)^2}$, for the existing condition before improvement;

q_1 = The infiltration value in cubic feet per minute per square foot, $\frac{CFM}{(ft.)^2}$, for the proposed condition after improvement with a positive shut-off;

A = The cross sectional area of the flue or connector in square feet.

D. Install attic insulation. The following equation

shall be used to calculate ΔH for energy efficiency standard 4 (2 MCAR S 1.16205 A.).

Equation No. 4:

$$\Delta H = \left(\frac{1}{R_0} - \frac{1}{R_1} \right) \times A$$

Where:

R_0 = The total R-value of the attic/ceiling/roof assembly including existing insulation before improvement;

R_1 = The total R-value of the proposed attic/ceiling/roof assembly including existing insulation and additional insulation after improvement;

A = The area of the attic/ceiling/roof assembly in square feet separating conditioned space from unconditioned space.

E. Install rim joist insulation. The following equation shall be used to calculate ΔH for energy efficiency standard 5 (2 MCAR S 1.16205 A.).

Equation No. 5:

$$\Delta H = \left(\frac{1}{R_0} - \frac{1}{R_1} \right) \times A$$

Where:

R_0 = The total R-value of the rim joist assembly including existing insulation before improvement;

R_1 = The total R-value of the rim joist assembly including existing and additional insulation after improvement;

A = The area of the rim joist assembly in square feet separating conditioned space from unconditioned space.

F. Install wall and/or floor insulation. The following equation shall be used to calculate ΔH for energy efficiency standard 6 (2 MCAR S 1.16205 A.).

Equation No. 6:

$$\Delta H = \left(\frac{1}{R_0} - \frac{1}{R_1} \right) \times A$$

Where:

R_0 = The total R-value of the existing wall or floor assembly including existing insulation before improvement;

R_1 = The total R-value of the proposed wall or floor assembly including existing and additional insulation after

improvement;

A = The area of the wall or floor assembly in square feet separating conditioned space from unconditioned space.

G. Install storm windows and/or thermal windows. The following equation shall be used to calculate ΔH for energy efficiency standard 7 (2 MCAR S 1.16205 A.).

Equation No. 7:

$\Delta H = (U_0 - U_1) \times A$

Where:

U_0 = The U-value for the existing window assembly before improvement;
U_1 = The U-value for the proposed window assembly after improvement;

A = The area of the window assembly in square feet separating conditioned space from exterior.

H. Install storm doors and/or thermal doors. The following equation shall be used to calculate ΔH for energy efficiency standard 8 (2 MCAR S 1.16205 A.).

Equation No. 8:

$\Delta H = (U_0 - U_1) \times A$

Where:

U_0 = The U-value for the existing door assembly before improvement;
U_1 = The U-value for the proposed door assembly after improvement;

A = The area of the door assembly in square feet separating conditioned space from exterior.

2 MCAR S 1.16220 Authorization. These rules are promulgated pursuant to Minnesota Statutes, section 116H.129, subdivisions 5, 6 and 7. (1978)

2 MCAR S 1.16221 Purpose and scope. The purpose of these rules is to establish procedures for a residential energy disclosure program and for certification of evaluators.

2 MCAR S 1.16222 Disclosure program. Effective October 1, 1980. Prior to time of sale, as required by Minnesota Statutes, section 116H.129, subdivisions 5, 6 and 7, an evaluation and report disclosing the extent of compliance with energy conservation standards for existing residences (2 MCAR S 1.16205) shall be made for all residences constructed prior to January 1, 1976, unless the buyer waives the disclosure report.

Evaluators shall use a disclosure report form approved by the building code division in consultation with the Minnesota Energy Agency and the legislature. Evaluators calculations shall be made on forms prepared by the building code division and/or the Minnesota Energy Agency. Evaluators shall maintain copies of completed disclosure reports which shall be available for review by the building code division or the Minnesota Energy Agency. Evaluators shall submit an annual summary of evaluations to the Minnesota Energy Agency. Copies of completed disclosure reports shall be retained by evaluators for a period of not less than five years.

Prior to time of sale the potential buyer of any residence constructed prior to January 1, 1976, shall be furnished with a disclosure report signed by a certified evaluator, which shall indicate the extent of compliance with the energy conservation standards for existing residences (2 MCAR S 1.16205). If the buyer chooses to waive the disclosure report he may do so by signing a waiver provision on the disclosure report form. Completed disclosure reports and evaluators calculations shall be submitted to the owners by evaluators within 30 days of request for evaluation.

2 MCAR S 1.16223 Certification. A certification shall be issued to qualified applicants upon successful completion of an examination evidencing knowledge of structural and energy use characteristics of residences and proficiency in evaluation of buildings, submittal of a copy of a bond required under 2 MCAR S 1.16226 and payment of fee required under 2 MCAR S 1.16227.

2 MCAR S 1.16224 Standards for certification, prerequisites. Persons possessing one of the following qualifications shall be eligible to be admitted for examination;

A. Building officials, certified by examination by the

building code division.

B. Architects and mechanical engineers registered in the state of Minnesota.

C. Truth in housing evaluators and truth in sale of housing evaluators certified by examination by the cities of Minneapolis and St. Paul.

D. Individuals experienced in weatherization procedures who have completed a minimum of twenty-five (25) audits and six (6) months satisfactory work with a nonprofit weatherization program.

E. Employees of participating utility companies trained to perform audits under the federal residential conservation program.

F. Persons who have successfully completed a prescribed course or courses of training for residential evaluators, sponsored by the Minnesota Energy Agency.

G. Persons who have successfully completed a course or courses of training for residential evaluators sponsored by the University of Wisconsin extension division, or similar courses, with prior approval of the building code division.

Said persons shall be required to attend an orientation program prior to examination.

2 MCAR S 1.16225 Examinations. Examinations shall be conducted at least once a year, or based upon receipt of request for examination more often, at locations determined by the building code division. Notice of time and place of examination shall be provided by the building code division by publication in the State Register and Building Code Newsletter published at regular intervals or to persons upon request. Applications for examination with required fee must be received by the building code division a minimum of two (2) weeks prior to established examination dates.

2 MCAR S 1.16226 Bond required. Evaluators must provide a bond to the state in the sum of $5,000 conditioned upon the faithful and lawful performance of all work done pursuant to these rules and Minnesota Statutes, section 116H.129, and such bond shall be for the benefit of persons injured or suffering financial loss by reason of failure of such performance. The bond shall be filed with the building code division and must be continuously applicable for the period of the certificate. Such bond shall be written by a corporate surety licensed to do business in the state of Minnesota. Bonds shall not be required for evaluators in the employ of municipal governments.

2 MCAR S 1.16227 Certification fees. Application for evaluator

certification must be accompanied by a fee of $50 remitted to the building code division, payable to the state of Minnesota. No fee shall be charged upon receipt of an application by a certified municipal building official who is directly employed by a municipality as defined in Minnesota Statutes, section 16.84, subdivision 3.

2 MCAR S 1.16228 Conflict of interest. Evaluators shall not be engaged in nor have an interest in the sale of products referenced in the standards.

Evaluators shall not own nor have an interest in properties that they evaluate. Holding of a listing for sale by a person or persons employing firm constitutes an interest in property.

Public utilities evaluation programs such as residential conservation services (RCS) are not to be considered a conflict of interest.

2 MCAR S 1.16229 Nonendorsement. The evaluator shall not endorse the use of specific materials, brand names of material or product, person, firm, contractor or methods which may be used to meet any specific standard, nor shall any statement relating to the standards be interpreted as an endorsement of any specific material or product.

2 MCAR S 1.16230 Revocation. Certification shall be revoked upon cancellation or expiration of a bond. When reasonable evidence discloses a conflict of interest, unethical practices or negligent performance of duties by the evaluator, the building code division shall notify the evaluator of its intent to revoke the certificate and provide for a contested case proceeding in accordance with the provisions of Minnesota Statutes, section 15.041 et. seq.

§§ 1.15509 through 1.15999 Reserved for future use.

0211

2 MCAR S 1.18601 Electrical. Scope. All new electrical wiring, apparatus, and equipment for electric light, heat and power shall comply with the regulations contained in the 1981 edition of the National Electrical Code (NEC) as approved by the American National Standards Institute (ANSI-CI-1981) and Minnesota Statutes, section 326.243 and the State Building Code as promulgated by the commissioner of administration. Synopsis as follows:

1. 2 MCAR §§ 1.10101-1.10109	Administrative Sections
2. 2 MCAR § 1.10111	Adoption of 1979 Uniform Building Code by Reference
Amended UBC 104(a)	Smoke Detector Requirements for Existing R-3 and R-4 Occupancies
UBC 104(e)	Application to Moved Buildings
Amended 104(f)	Historic Buildings
Amended UBC 203	Unsafe Buildings
Amended UBC 205	Violations
Amended UBC 307(a)	Certificate of Occupancy
Amended UBC 405, 406, 407, 414, and 420	Definitions
UBC 502	Change In Use
Amended UBC 512	Roof Access GFCI Outlet and Accessible Disconnect
Amended UBC 605	Lighting Group A Occupancies
Amended UBC 705	Lighting Group B Occupancies
Amended UBC 805	Lighting Group E Occupancies
Amended UBC 809	Fire Alarm—Group E Occupancies
Amended UBC 905	Lighting Group H Occupancies
Amended UBC 1005	Lighting Group I Occupancies
Amended UBC 1009	Fire Alarm Group I Occupancies
Amended UBC 1210	Fire Alarm/Smoke Detectors Group R Occupancies

	Amended UBC 1216	Sound Transmission Control R-1 Occupancies
	UBC 1706	Shaft Enclosures
	UBC 1807 and Amended UBC 1807(h)	Special Provisions for High-Rise Buildings/Group B2 (Office) & R-1
	UBC 3312	Exit Signs and Exit Illumination
	UBC 3317	Smoke Detectors/Group E Occupancies
	Amended UBC 3802(e)	Automatic Fire Extinguishing Systems for Commercial Cooking Equipment
	UBC 4303(b) 6, 4304(e), 4305	Penetrations of Fire Resistive Assemblies
3.	2 MCAR §§ 1.10303-1.10335	Prefabricated and Manufactured Structures Code
4.	2 MCAR §§ 1.15501-1.15508	Facilities for the Handicapped
5.	2 MCAR §§ 1.16001-1.16606	Energy Code
6.	SBC 8301	Electrical Space Heating
7.	SBC 8505	HVAC System Shutdowns
8.	2 MCAR §§ 1.18801-1.18813	Elevators, Dumbwaiters, Escalators, Manlifts, Moving Walks, Hoists, Lifts & Wheelchair Elevating Devices
	2 MCAR § 1.18806 B. 6.	Standby Power
	2 MCAR § 1.18806 C. Amended Rule 101.5a	Machine Room, Lighting and Outlet
	Amended Rule 106.1e	Pit Lighting & Outlet
9.	2 MCAR § 1.18901	Flood Proofing Regulations
10.	2 MCAR §§ 1.90100-1.90904	Rules for Mobile Homes

MCAR - Minnesota Code of Agency Rules
UBC - Uniform Building Code
SBC - Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code

NEC Table 220-2(b) is amended as follows:

Unit load per sq. ft. (Watts) for Banks and Office Buildings shall be reduced from 5 to 3.

Table 220-2(b). General Lighting Loads by Occupancies

Type of Occupancy	Unit Load per Sq. Ft. (Watts)
Armories and Auditoriums	1
Banks	3
Barber Shops and Beauty Parlors	3
Churches	1
Clubs	2
Court Rooms	2
* Dwelling Units	3
Garages—Commercial (storage)	½
Hospitals	2
* Hotels and Motels, including apartment houses without provisions for cooking by tenants	2
Industrial Commercial (Loft) Buildings	2
Lodge Rooms	1½
Office Buildings	3
Restaurants	2
Schools	3
Stores	3
Warehouses (Storage)	¼
In any of the above occupancies except one-family dwellings and individual dwelling units of multifamily dwellings:	
Assembly Halls and Auditoriums	1
Halls, Corridors, Closets	½
Storage Spaces	¼

* All receptacle outlets of 20-ampere or less rating in one-family and multifamily dwellings and in guest rooms of hotels and motels [except those connected to the receptacle circuits specified in Section 220-3(b)] shall be considered as outlets for general illumination, and no additional load calculations shall be required for such outlets.

NEC 300-22(b) is amended by adding an exception as follows:

Exception: In Group B, Division 2, occupancies, communications circuits such as those set out in Section 800-1 may be installed in return air handling plenums located above ceilings without being installed in metallic tubing, metal conduit, or other types of metallic raceways when the building housing such Group B Division 2, occupancies is provided with an approved, fully automatic sprinkler system or the main return and exhaust air plenum is provided with approved smoke detectors which, when activated, shall place into operation all equipment necessary to prevent the recirculation of smoke. All such communication wiring, when abandoned, shall be removed upon order from the building official.

NEC Section 700-6(b)(3) is amended to read as follows:

Prime movers may be solely dependent upon a public utility gas system for their fuel supply when the Building Official determines that there is low probability of a simultaneous failure of both the off-site fuel delivery system and power from the outside electrical utility company. Means shall be provided for automatically transferring from one fuel supply to another where dual fuel supplies are used. When such a public utility gas system is approved by the Building Official, the requirement for an on-site fuel supply of two hours is not required. A public utility gas system shall not be an approved fuel supply for prime movers in buildings which are located in a designated flood plain area or in areas designated other than sesmic zone "O".

NEC Section 800-3 is amended to read as follows:

(d) Location. Circuits and equipment installed in ducts and plenums shall also comply with Section 300-22 as to wiring methods.

Exception No. 1: Conductors listed as having adequate fire-resistant and low-smoke producing characteristics shall be permitted for ducts, hollow spaces used as ducts, and plenums other than those described in Section 300-22(a).

Exception No. 2: In existing buildings of Group A and B occupancies, communication circuits may be installed in existing suspended ceiling plenums used for environmental air if the construction of the affected floor or level of the building does not exceed 50% of the value of new construction of that floor or level within a twelve month period.

All such communication wiring shall be grouped and shall be independently supported from the structure. All such communication wiring when abandoned shall be removed. This exception shall not apply if the building official determines that such installation constitutes an increased hazard to life and/or property. This exception shall not apply when listed conductors are available.

The conductors referred to in this section would ordinarily be insulated, but the kind of insulation is not specified as reliance is placed on the protective device to stop all dangerous voltages and currents.

§ 1.18701 Plumbing. All plumbing in buildings and structures as defined in the Minnesota Building Code shall comply with the provisions of the Minnesota Plumbing Code 1979, which code is adopted by reference and made a part of the code.

§ 1.18801 Elevators, dumbwaiters, escalators, manlifts, moving walks, hoists and lifts. General. Elevators, dumbwaiters, escalators, manlifts, moving walks, hoists and lifts shall be designed, constructed, installed and maintained so as to be reasonably safe to life, limb and adjoining property.

§ 1.18802 Definitions. For the purpose of this chapter, the terms or words listed below shall have the meaning indicated:

EXISTING INSTALLATION. Shall mean an installation on which the construction or installation was begun prior to the effective date of this Code.

NEW INSTALLATION. Shall mean an installation on which the construction or installation was begun subsequent to the effective date of this Code.

§ 1.18803 Existing installations is amended to read as follows:

A. All existing installations may be continued in service as long as they are properly maintained and are, in the opinion of the administrative authority, installed and maintained in a safe condition. The Administrative Authority may order the installation of car gates, car tops, and the car walls extended to the car top on all existing installations. The Administrative Authority shall have the authority to shut down any piece of equipment covered by this chapter, which in his opinion is dangerous to life, limb, and adjoining property, and such equipment shall not be put back into operation until such unsafe condition has been corrected and approved by the Administrative Authority.

B. Any installation which is materially changed subsequent to the date of enactment of this Code shall comply with all of the requirements covering a new installation.

A material change shall be defined as any change which moves the location, increases or decreases the length of travel, changes the type of operation, increases the speed or carrying capacity or changes the types of power supply of an existing installation.

Any installation, whether new or existing, which shall become damaged, defective or worn by fire or other causes including ordinary wear to such an extent that in the opinion of the administrative authority it becomes dangerous to life, limb and adjoining property, such installations shall be repaired or rebuilt in conformity with the provisions of this chapter for new installations. Such equipment shall, if in the opinion of the administrative authority, it is found necessary to protect life, limb and property, be taken out of service until such unsafe condition has been removed.

C. Unsafe conditions. When an inspection reveals an unsafe condition, the

inspector shall immediately file with the owner and the Administrative Authority a full and true report of such inspection and such unsafe condition. If the Administrative Authority finds that the unsafe condition endangers human life, he shall cause to be placed on such elevator, escalator or moving walk in a conspicuous place, a notice stating that such conveyance is unsafe. The owner shall see to it that such notice of unsafe condition is legibly maintained where placed by the Administrative Authority. The Administrative Authority shall also issue an order in writing to the owner requiring the repairs or alterations to be made to such conveyance which are necessary to render it safe, and may order the operation thereof discontinued until the repairs or alterations are made or the unsafe conditions are removed. A posted notice of unsafe conditions shall be removed only by the Administrative Authority when he is satisfied that the unsafe conditions have been corrected.

§ 1.18804 Inspection, tests and approval is amended to read as follows:

A. Approval of plans. Any person, firm or corporation desiring to install, relocate, alter materially or extend any installation covered by this chapter shall be required to obtain approval for so doing from the administrative authority. Two sets of drawings and specifications showing such installations, relocation, alteration or extension shall be submitted for approval.

B. Inspections and tests. It shall be unlawful for any person, firm or corporation to put into service any installation covered by this chapter whether such installation is newly installed, relocated or altered materially without such installation being inspected and approved by the administrative authority. The installer of any equipment included in this chapter shall notify the administrative authority seven days prior to completion of the installation for such inspection. The administrative authority shall have the authority to require such tests as provided in ANSI A17.1-1978 Edition and Supplement as he may deem necessary to prove the safe operation of any installation.

C. Approval. A certificate or letter of approval shall be issued by the administrative authority for such installation when the entire installation is completed in conformity with this chapter. The entire installation shall include all enclosures or shafts, gates, doors, machinery safety and control devices and all other appurtenances necessary.

D. Limited use of an elevator. When a building or structure is to be equipped with one or more elevators, at least one of such elevators may be approved for limited use prior to the completion of the building or structure.

The use of such elevators may be permitted by the administrative authority under the authority of a limited permit issued by him for each class of service. Such limited permit shall specify the class of service. Such limited permit shall specify the class of service permitted and it shall not be issued until the elevator has been tested with rated load and the car safety and terminal stopping equipment have been tested to determine the safety of the equipment and until permanent or temporary guards or enclosures are placed on the car and around the hoistway and at the landing entrance on each floor.

Landing entrance guards shall be provided with locks that can be released from the hoistway side only. Automatic and continuous pressure elevators shall not be placed in temporary operation from the landing push buttons unless door locking devices and/or interlocks are installed and operative.

§ 1.18805 Accidents.

A. To be reported. The owner or person in control of an elevator or other installation covered by this chapter shall promptly notify the administrative authority of any accident to a person or apparatus, on, about, or in connection with such elevator or other installation, and shall afford the administrative authority every facility for investigating such accident and the damage resulting therefrom. Notification may be given to the administrative authority by telephone or verbally, but such notification shall be confirmed in writing.

B. Investigation. The administrative authority shall make or cause to be made an investigation of the accident and the report of such investigation shall be placed on file in his office. Such report shall give in detail the cause or causes, so far as they can determine, and such report shall be open to public inspection.

C. Operation discontinued. When an accident involves the failure or destruction of a part of the installation or the operating mechanism, the elevator or other installation shall be taken out of service and shall not be used again until it has been made safe and such re-use approved by the administrative authority.

The administrative authority may, if deemed necessary, order the discontinuance of operation of any such elevator or installation until a new certificate of approval has been issued.

D. Removal of parts restricted. No part of the damaged installation, construction or operating mechanism shall be removed from the premises until permission is granted by the administrative authority.

§ 1.18806 Elevators, dumbwaiters, escalators and moving walks is amended to read as follows:

A. The ninth edition of the American National Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks—ANSI A17.1-1978 including supplement ANSI A17.1a-1979, are hereby incorporated by reference and made a part of this Code. All references in ANSI A17.1-1978 and supplements, to the National Electrical Code shall be changed to read: "National Electrical Code" ANSI C1 1978 (NFPA 70-1978).

B. Exceptions to ANSI A17.1.

1. Winding drum machine. Winding drum machines shall not be permitted on new elevators installations nor replacements on existing installation.

2. Swing doors. Horizontal swing doors, either single section or center opening two section, shall not be permitted on new elevator installations nor as replacements on existing installations, except the administrative authority may approve such installation if the conditions are such as to make it impossible to install other than swing doors.

3. Side exits. Side emergency exits on elevator cars shall not be permitted.

4. In each elevator lobby served by elevators complying with ANSI rule 211.3 of the Elevator Code identified as ANSI A17.1-1978, all automatic-operation elevators serving three or more stories above or below the main floor or having a travel of twenty five (25) feet or more above or below the main floor, at least one elevator car serving all floors in a building shall have a platform size that is standard for the elevator supplier, and capable of accommodating an ambulance stretcher in its horizontal position. The opening to the elevator car shall be capable of passageway for such ambulance stretcher.

5. Exterior elevator call buttons shall be placed not higher than 60 inches above the floor. No emergency stop switch, door opening and door closing buttons, or elevator floor buttons shall be placed higher than 60 inches above the floor.

6. Standby power. In every building over one story and more than 75 feet in height, emergency power shall be provided for at least one passenger elevator in each bank. This emergency power shall be transferable to any other elevator in the bank and shall be capable of operating the elevator with a full load at contract speed or not less than 150 feet per minute. Emergency power shall be provided by an approved self-contained generator set to operate whenever there is a loss of power in the normal power supply. The generator shall be in a separate room having at least a one-hour fire resistive occupancy separation from the remainder of the building and shall have an on site fuel supply adequate to operate the equipment for two hours. See UBC Standards 18-1.

7. Operating devices. All operating devices shall be of the enclosed electric type. Rope or rod operated devices activated by hand, or rope operating devices activated by wheels, levers or cranks, shall be removed. EXCEPTION: This shall not be considered a material change.

C. Amendments to ANSI A.17.1-1978.

ANSI A17.1—Rule 100.4a is amended to read as follows:

100.4a—Vents Required.

Hoistways of elevators serving more than three (3) floors shall be provided with means for venting smoke and hot gases to the outer air in case of fire. Vents may be manually openable or remote control automatic vents. Location of operating devices are subject to approval of the Fire Chief.

EXCEPTIONS: Hoistways not extending into the top floor of the building, in buildings other than hotels, apartment houses, hospitals and similar buildings with overnight sleeping quarters, where the hoistways are equipped with approved automatic sprinklers connected to the building water-supply system or to an approved automatic sprinkler system (See NFPA No. 13-1976 Sprinkler Systems). Such systems shall be responsive to an accumulation of smoke as well as heat at the top of the hoistway.

ANSI A17.1—Rule 100.4b is amended to read as follows:

100.4b Location of Vents.

Vents shall be located:

1. In the side of the hoistway enclosure directly below the floor or floors at the top of the hoistway, and shall open either directly to the outer air or through noncombustible ducts to the outer air; or

2. In the wall or roof of the penthouse or overhead machinery space above the roof, provided that openings have a total area not less than the minimum specified in Rule 100.4c. Vents passing through machine rooms must be in noncombustible ducts. When a vent is installed in the roof of the hoistway, a protective grill shall be provided to prevent persons from falling into hoistway.

ANSI A17.1—Rule 101.5a is amended to read as follows:

101.5a Lighting.

Permanent electric lighting shall be provided in all machine rooms and machinery spaces.

The illumination shall be not less than ten (10) foot-candles at the floor level. The lighting control switch shall be located within easy reach of the access to such rooms or spaces. Where practicable, the light control switch shall be located on the lock-jamb side of the access door.

A 20 ampere 110-120 volt AC ground type convenience outlet shall be installed in the machine room. The circuit for this convenience outlet shall not be connected to the equipment circuits.

ANSI A17.1—Rule 106.1e is amended to read as follows:

106.1e Illumination of Pits.

A permanent lighting fixture shall be provided in all pits, which shall provide an illumination of not less than five (5) foot-candles at the pit floor. A light switch shall be provided and shall be so located as to be accessible from the pit access door.

A 20 ampere 110-120 volt AC ground type convenience outlet shall be installed in the pit. The circuit for this convenience outlet shall not be connected to the equipment circuits.

ANSI A17.1–Rule 110.2a is amended to read as follows:

ANSI A17.1–Rule 110.2a–For Passenger Elevators and Freight Elevators Authorized to Carry Employees.

Entrances shall be one of the following types:

1. Horizontal side, single or multisection.

2. Swing, single-section.

3. Combination horizontal slide and swing.

4. Power-operated, vertical slide biparting counterbalanced, or vertical slide counterweighted which slide down to open, where located at entrances used by passenger (See Rule 207.4).

5. Hand or power-operated vertical slide which slide up to open.

EXCEPTION: At landing openings used exclusively for freight, any type of entrance permitted by Rule 110.2b.

6. Elevator doors shall provide a clear opening of at least 32 inches.

ANSI A17.1–Rule 111.9b is amended to read as follows:

111.9b–Location and Design of Hoistway Access Switches.

Hoistway access switches shall conform to the following:

1. Hoistway access switches shall be provided at top and bottom landings. The operation of the switch at the top floor shall be zoned to stop the top of the elevator car substantially level with the top floor.

2. The switch shall be installed adjacent to hoistway entrance at the access landing with which it is identified.

3. The switch shall be of the continuous-pressure spring-return type, and shall be operated by a cylinder-type lock having not less than a five (5) pin or five (5) disc combination with the key removable only when the switch is in the "OFF" position. The lock shall not be operable by any key which will operate locks or devices used for other purposes in the building. The key shall be available to and used only by inspectors, maintenance men, and repairmen.

ANSI A17.1–Rule 111.9e is amended to read as follows:

111.9e—Location and Design of Hoistway Door Unlocking Devices.

Hoistway door unlocking devices shall conform to the following:

1. The device shall unlock and permit the opening of the hoistway door from the lowest landing irrespective of the position of the car.

2. The device shall be installed only at the lowest landings.

EXCEPTION: For Emergency use, see Rule 111.10.

3. The device shall be designed to prevent unlocking the door with common tools.

4. The operating means for unlocking the door shall be provided with a special key not easily duplicated, and said key shall be available only to elevator mechanics and inspectors. The interlocks shall be designed and adjusted as to prevent movement of the car until after the door is closed and in the locking position.

5. The unlocking-device keyway shall be located at a height not greater than six (6) feet eleven (11) inches above the floor.

NOTE: For diagrammatic representation, see Appendix C.

ANSI A17.1—Rule 112.5 is amended to read as follows:

ANSI A17.1—Rule 112.5—Reopening Device for Power-Operated Car Doors or Gates.

Where required by Rule 112.3d or Rule 112.4, a power-operated car door or gate shall be provided with a reopening device which will function to stop and reopen a car door or gate and the adjacent hoistway door in the event that the car door or gate is obstructed while closing. If the closing kinetic energy is reduced to two and one-half (2-1/2) foot pounds or less, the reopening device may be rendered inoperative (see Rule 112.4-a).

For center-opening doors, the reopening device shall be so designed and installed that the obstruction of either door panel when closing will cause the reopening device to function.

Hoistway door protection in passenger elevators. Hoistway doors on all passenger elevators shall not be solely dependent upon the door edge reopening device for protection from the doors closing on an obstruction, but shall also be provided with an approved light beam or electronic door protection device.

ANSI A17.1—Rule 204.2a is amended to read as follows:

204.2a—Material for Enclosures and Enclosure Linings.

Car enclosures and car-enclosure linings shall conform to the following:

1. Material for enclosures shall be:

   a. Metal; or

   b. Fire-retardant-treated wood; or

   c. Other equally fire retardant approved material.

EXCEPTION: Non-fire-retardant treated wood or materials of equivalent combustible characteristics may be used if all exterior surfaces of the enclosure are covered with sheet metal not less than No. 27 U.S. gauge or other equally fire-retardant material or are are protected by painting with an approved fire-retardant paint having a flame spread rating of not over 50, applied in accordance with the instructions of the manufacturer. Such ratings shall be based on the test procedure specified in ANSI/ASTM E84.

2. Slow burning combustible materials for insulating, sound deadening or decorative purposes may be used for lining enclosures if firmly bonded flat to the enclosure. Such materials shall not be padded. Materials must have a Class 1 Flame Spread Rating.

EXCEPTION: Padded protective linings used temporarily in passenger cars during the handling of freight, provided the pads are made of fire-retardant material or treated with an acceptable fire retardant. The fire retardant-treatment shall be renewed as needed. The protective linings shall clear the floor of the car by not less than four (4) inches.

ANSI A17.1—Rule 206.4c is amended to read as follows:

206.4c—Type of Speed-Governor Overspeed Switches, Speed-Reducing Switches, and Car-Safety-Mechanism Switches Required.

Switches used to perform the function specified shall be positively opened. Overspeed and speed-reducing switches permitted by the exception to Rule 206.4b and operated by the speed governor shall remain in the open position until manually reset. Switches operated by the car safety mechanism shall be the manually reset type.

ANSI A17.1—Rule 211.1 is amended to read as follows:

Rule 211.1

Emergency communications. Every elevator car shall be provided with a two-way communication system connected to an approved emergency service which operates 24 hours every day.

ANSI A17.1—Rule 211.3a is amended to read as follows:

211.3a—Automatic-Operation Elevators.

All automatic-operation elevators serving three or more landings or having a travel of twenty-five (25) feet or more, shall conform to the following:

1. A three position (on, off, and by-pass) key-operated switch shall be provided at the main floor for each single elevator or for each group of elevators. The key shall be removable only in the "on" and "off" positions. When the switch is in the "on" position, all elevators controlled by this switch and which are on automatic service shall return nonstop to the main floor, and the doors shall open and remain open.

a. An elevator traveling away from the main floor shall reverse at the next available floor without opening its doors.

b. Elevators equipped with automatic power-operated doors and standing at a floor other than the main floor, with doors open, shall close the doors without delay, and proceed to the main floor.

c. Door reopening devices for power-operated doors which are sensitive to smoke, heat or flame shall be rendered inoperative.

d. All car and corridor call buttons shall be rendered inoperative and all call registered lights and direction lanterns shall be extinguished and remain inoperative.

e. A car stopped at a landing shall have its "Emergency Stop Switch" rendered inoperative as soon as the doors are closed and it starts toward the main floor. A moving car, traveling to or away from the main floor, shall have its "Emergency Stop Switch" rendered inoperative immediately.

f. A sensor in each elevator lobby, which when activated prevents cars from stopping at that floor, shall not be substituted for the above requirements.

2. Sensing Devices.

In addition to the key-operated switch required in 1 above, heat and smoke or products of combustion sensing devices shall be installed in accordance with NFPA No. 72D 1975 in each elevator lobby at each floor, except the main floor. The activation of a sensing device in any elevator lobby shall cause all cars in all groups that serve that lobby to return nonstop to the main floor. The operation shall conform to the requirements of 211.3a-1-a to 211.3a-1-e. The key-operated switch required by 211.3a-1, when moved to the "by-pass" position, shall restore normal service independent of the sensing devices.

EXCEPTIONS:

(1) Elevators in buildings which are completely protected by an automatic sprinkler system (See NFPA No. 13 1976 Sprinkler Systems).

(2) Freight elevators located in or at openings into manufacturing areas.

(3) Elevator lobbies at unenclosed landings.

3. Elevators without a terminal landing at grade level shall be returned to that landing closest to grade level or other approved level and shall conform to the requirements of 211.3a-1, -2, -3, -4, -5, -6.

4. One (1) car in each bank of automatic-operation elevators serving five (5) or more floors above or below the main floor or having a travel of fifty (50) feet or more above or below the main floor shall be provided with the following operation:

A two position (off and on) key-operated switch shall be provided in or adjacent to an operating panel in each car and it shall be effective only when the main floor key-operated switch (211.3a-1) is in the "on" position or a sensing device has been activated and the car has returned to the main floor or other approved level. The key shall be removable only in the "off" position and when in the "on" position, it shall place the elevator on emergency operation.

The operation of elevators on emergency service shall be as follows:

a. An elevator shall be operable only by a person in the car.

b. Elevators shall not respond to elevator corridor calls.

c. The opening of power-operated doors shall be controlled only by continuous pressure "open" buttons or switches. If the switch or button is released prior to the doors reaching the fully open position, the doors shall automatically reclose. Open doors shall be closed by either the registration of a car call or by pressure on "door close" switch or button.

d. Elevator shall be removed from emergency service by moving the emergency service key-operated switch in the car to the "off" position with the car at the main floor.

5. Multi-deck elevators shall conform to the requirements of 211.3a-1, -2, -3, -4, -6, and to additional requirements as follows:

a. The key-operated switch required by 211.3a-1 may be located at either main lobby.

b. The key-operated switch in the car required by 211.3a-4 for emergency service operation shall be located in the top deck. The elevators shall be provided with means for placing the lower deck out of service including closing of car and hoistway doors. The lower deck shall be out of service before the emergency service operation from the top deck becomes effective. The means for placing the lower deck out of service shall be located in that deck or adjacent to the entrance in the corridor.

6. The switches required by 211.3a-1 and 211.3a-4 shall be operated by the same key but which is not a part of a building master key system. There

shall be a key for the main floor switch and for each elevator in the group and these keys shall be kept on the premises by persons responsible for maintenance and operation of the elevators, in a location readily accessible to authorized persons, but not where they are available to the public.

7. The switches required by 211.3a-4 shall conform to the following:

Emergency elevators. All keyed switches installed to operate elevators on emergency service shall be required to be keyed alike to a pattern approved by the Administrative Authority. In lieu of the above, keys for emergency elevator service may be in a metal box placed in a location approved by the Administrative Authority, provided said box is locked with a 5 pin tumbler core lock or equivalent which is keyed to the same pattern.

ANSI A17.1—Rule 602.1 is amended to read as follows:

Rule 602.1—Car Safeties.

Elevators having a travel of more than fifteen (15) feet shall be provided with a car safety, attached to the underside of the car frame, capable of stopping and sustaining the car and rated load.

The car safety device is not required to be operated by a speed governor, and may be of the instantaneous type operated as a result of the breaking or slackening of the suspension members.

Where the travel exceeds forty (40) feet, driving machines having hand-operated brakes shall also be equipped with an automatic speed retarder.

All handpowered elevators shall be equipped with a broken rope safety device.

ANSI A17.1—Rule 703.1 is amended to read as follows:

Rule 703.1—Where Required.

Car and counterweight safeties shall not be required except for protection of spaces below hoistways for all dumbwaiter cars and counterweights having a rated load over twenty-five (25) pounds. Where required, the car and counterweight safeties may be operated as a result of breaking the suspension means and may be of the inertia type without governors. Car safeties may be located in the car crosshead.

All dumbwaiters shall be equipped with a broken rope safety device.

§ 1.18807 Stage and orchestra lifts. Stage and orchestra lifts shall be designed, installed, constructed and maintained so as to be reasonably safe to life, limb and adjoining property and shall be approved by the administrative authority prior to installation or construction.

§ 1.18808 Manlifts. Manlifts shall be designed, installed, constructed, and

maintained so as to be reasonably safe to life, limb, and adjoining property shall conform to the standards specified in the American National Safety Code for manlifts, ANSI A90.1-1969 and Regulations of the Department of Labor and Industry. 8 MCAR § § 1.7120-1.7129.

§ 1.18809 Temporary interior and exterior hoists. Temporary interior and exterior hoists shall be designed, constructed, installed and maintained so as to be reasonably safe to life, limb and adjoining property, shall conform to Safety Requirements for Workman's Hoists, ANSI 10.4-1963, Safety Requirements for material hoists, ANSI 10.5-1969 and Regulations of the Department of Labor and Industry.

§ 1.18810 Mechanical parking garage equipment. Mechanized parking garage equipment shall be designed, constructed, installed and maintained so as to be reasonably safe to life, limb and adjoining property, and shall conform to the standards specified in the American Standard Safety Code for Mechanized Parking Garage Equipment ANSI A113.1 (R-1971).

STANDARDS FOR WHEELCHAIR ELEVATING DEVICES

§ 1.18811 Standards for wheelchair elevating devices.

A. Applicability.

1. These rules apply to electric powered vertically traveling elevating devices used to raise or lower physically handicapped persons from one level to another in existing buildings, hereinafter in these rules referred to as a device.

2. The device shall conform to all applicable sections of ANSI A17.1-1978 National Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks, which are directly referred to in these rules.

§ 1.18812 Hoistways, hoistway enclosures.

A. Hoistway walls shall be provided on all sides of the device not used for entrance or exits. Walls shall be fully enclosed and of non-combustible material. Walls shall extend to a height of at least the top terminal landing level. When terminated at top landing level or any level below 42" above top terminal landing a guard rail conforming to UBC § 1716 shall be provided.

B. Strength of enclosure. See Rule 100.1e.

C. Construction at top of hoistway. A ceiling at the top of the hoistway is not required unless a hazard exists from falling objects from overhead. When a ceiling is provided it must be noncombustible material and must reject a ball 1" in diameter. Minimum clear headroom 7'-0".

D. Construction at bottom of hoistway. A pit is not required, but when provided it shall be designed as to prevent entry of ground water. The floor

at the bottom level shall be designed to accept the loads imposed upon it. (U.B.C. Chapter 23.)

E. All ramp surfaces leading to or from the device shall be of the nonskid type. Ramps slope shall not exceed a ratio of 1 vertical to 12 horizontal.

F. Devices shall not be exposed to the outside elements.

G. Projections recesses and setbacks in hoistway enclosures, see Rule 100.6 and Rule 110.10A (Omit Item 1 only).

H. Means shall be provided to prevent movements of platform when loading or unloading.

I. For electrical wiring, pipes and ducts in hoistways and machine rooms, see Rule 102.

J. Location of device. The device may be installed in a stair enclosure or exit system provided it does not reduce or obstruct exit widths as required in UBC Chapter 33.

K. All exposed equipment on a device shall be guarded to protect against accidental contact which could cause bodily injury.

L. A movable barrier (or gate) at the upper terminal landing shall be installed to prevent a wheelchair from rolling off end of landing while waiting for the device. All movable barriers are to be self closing when the platform leaves the floor level. Means shall be provided so barrier can not be opened unless platform is in the top landing zone. When the movable barriers to the device are power operated they must meet all requirements of Section 1 Rule 112.

M. The terminal landings shall be permanently fastened, and constructed so as to safely carry the imposed loads.

N. Upper terminal ramp or landing shall be provided with guard rails on open sides.

O. Lighting shall conform to Rule 204.7(a).

P. The device shall be permanently anchored and maintained in a level position.

Q. Guardrails shall be provided to protect against access to the area of the bottom terminal landing when skirt is utilized as a loading ramp.

R. The running clearance from front or rear to the permanent hoistway enclosure shall not be more than 1" nor less than 1/2".

§ 1.18813 Machinery and equipment for the devices.

A. The frame and platform shall be of steel or approved non combustible material. The platform shall not be larger than 42" wide by 60" long and not less than 36" wide x 48" long (inside dimensions).

B. The rated capacity shall be not less than 400 lbs. nor less than 33 and 1/3 pounds per square foot.

C. The device shall be designed to insure a safety factor of 5.

D. Welding on the device shall conform to rule 203.7.

E. Means shall be provided on vertical traveling devices to prevent access below the platform when it is in the raised position.

F. When a skirt is provided, they must be solid (not perforated or grilled), and may be hinged or collapsible type. If of hinged or collapsible type they shall have a switch to cut off the power to the driving machine in case of accidental contact with any object while device is moving downward. The required pressure on the skirt to make the switch function shall not exceed 4 lbs.

G. Means shall be provided to prevent wheelchair from rolling off platform when in operation.

H. The speed of the device shall not exceed 15 feet per minute in either direction under full load conditions.

I. The total travel of the device shall not exceed 54".

J. 1. Operating means shall be provided by the use of a universal key or magnetic card available and restricted to key personnel and physically handicapped persons.

2. Operation shall be by continuous pressure, key operated switches. Switches shall be arranged so that they will not remain in the run position unless held in position and will automatically return to the "off" position if released. Key switches shall be so located as to permit an unobstructed view of the entire length of the travel of the device.

3. A slack cable or chain switch shall be provided where applicable.

4. An upper and lower terminal stopping switch shall be provided to stop the device at the terminal landings.

5. The device shall conform to Rule 501.11c for control and operating circuit requirements.

K. A mechanical stop shall be provided at the top and bottom. Overtravel and undertravel shall not be more than 1" until the mechanical stop is reached. Stops shall be designed to stop the car at full load, full speed in both directions and have a safety factor of not less than 5.

L. A data plate shall be installed under the platform which shall contain: car weight, capacity, total load, and speed plus total load, and speed plus total weight of device.

M. A full load speed safety test shall be performed on an annual basis.

N. Covers to mechanism shall be removable, for inspection purposes.

O. A sign shall be placed inside the device indicating, "for use by physically handicapped persons only". Letters shall not be less than 2" high.

P. Maintenance shall be provided on the device and shall conform to applicable rules of Part 10.

Q. If the device is of the hydraulic type, the engineering shall conform to Rule 1302.

R. An alarm bell shall be installed in accordance with Rule 211.1 and shall be connected to a push button on car operating panel marked "alarm".

§ 1.18901 **Adoption of "Flood Proofing Regulations."** Sections 100 through 1406 of the 1972 Edition of "Flood Proofing Regulations" (FPR) as promulgated by the Office of the Chief Engineers, U.S. Army, Washington, D.C. is incorporated by reference and hereby made a part of the State Building Code subject to the following amendments:

(FPR Sections 201.2 through 208.2 are placed in the appendix of this Code.)

FPR Section 200.2 is amended to read as follows:

Official Flood Plain Zoning Map: The Official Plain Zoning Map showing the extent and boundaries of the Primary and Secondary Flood Hazard Areas is hereby declared and established as part of these Regulations. Hereinafter reference to term Primary Flood Hazard Areas in these regulations shall be synonymous with the term "flood plain areas" as used in the Minnesota Regulations NR 85-93.

FPR Section 200.3 is amended to read as follows:

Regulatory

Flood Datum: For the purpose of these regulations, the Regulatory Flood Datum, or as hereinafter referred to as the "RFD", is hereby declared and established for use as the reference datum for determining the elevation above mean sea level to which flood-proofing protection shall be provided. Hereinafter reference to the term "Regulatory Flood Datum" in these regulations shall be synonymous with the term "flood protection elevation" as used in Minnesota Regulations NR 85-93.

FPR Section 201.1 is amended to read as follows:

Application: These regulations shall apply to the construction, alteration, and repair of any building or parts of a building or structure in the Flood Hazard Area(s) of the municipalities. Additions, alterations, repairs and changes of use occupancy shall comply with all provisions for new buildings and structures as otherwise required in the Building Code, except as specifically provided in these Regulations.

FPR Section 201.2 is amended to read as follows:

This section shall apply unless equivalent provisions are incorporated in the city or county Flood Plain Zoning Ordinance.

Nonconforming Use: A structure or the use of a structure or premises which was lawful before the passage or amendment of the ordinance but which is not in conformity with the provisions of these Regulations may be continued subject to the following conditions:

1. No such use shall be expanded, changed, enlarged or altered in a way which increases its nonconformity.

2. No structural alteration, addition, or repair to any conforming structure over the life of the structure shall exceed 50 percent of its value at the time of its becoming a nonconforming use, unless the structure is permanently changed to a conforming use.

3. If such use is discontinued for 12 consecutive months, any future use of the building premises shall conform to these Regulations. The assessor shall notify the zoning administrator in writing of instances of non-conforming uses which have been discontinued for a period of 12 months.

4. If any nonconforming use or structure is destroyed by any means, including floods, to an extent of 50 percent or more of its assessed value, it shall not be reconstructed except in conformance with the provisions of these Regulations; provided, the Board of Appeals may permit reconstruction if the use or structure is located outside the floodway and is adequately and safely flood-proofed, elevated, or otherwise protected in conformance with these Regulations.

5. Uses or adjuncts thereof which are or become nuisances shall not be entitled to continue as nonconforming uses.

6. Any alteration, addition, or repair to any nonconforming structure which would result in substantially increasing its flood damage or flood hazard potential shall be protected as required by these Regulations.

7. The Building Official shall maintain a list of nonconforming uses including the date of becoming nonconforming, accessed value at the time of its becoming a nonconforming use, and the nature and extent of nonconformity. This list shall be brought up-to-date annually.

8. The Building Official shall prepare a list of those nonconforming uses which have been flood-proofed or otherwise protected in conformance with these regulations. He shall present such list to the Board of Appeals which may issue a certificate to the owner stating that such uses, as a result of these corrective measures, are in conformance with these Regulations.

FPR Section 203.3 is amended to read as follows:

Records. Copies of such tests, reports, certifications, or the results of such tests shall be kept on file in the office of the Building Official for a period of not less than two (2) years after the approval and acceptance of the completed structure for beneficial occupancy.

FPR Section 204.6 is amended to read as follows:

Board of Appeals: See 2 MCAR § 1.10111 UBC § 204.

FPR Section 204.7 is amended to read as follows:

Validity: It shall be unlawful for any person, firm or corporation or agency (state or local) to erect, construct, enlarge, alter, repair, move, improve, remove, convert, or demolish, any building or structure in the Flood Hazard Area(s), or cause the same to be done, contrary to or in violation of any of the provisions of these Regulations and/or "The Building Code".

FPR Section 205.1 is amended to read as follows:

Statement of Intention to Improve: The Owner or any registered architect or licensed professional engineer authorized to represent the Owner shall, before preparing final plans for any improvement in the Flood Hazard Area(s), file with the Building Official a Statement of Intention to Improve, including a brief description of the type of improvement being considered and giving its precise location, on a form provided by the Building Official. The Building Official shall note on two copies the elevation of the RFD at the location of the proposed improvement. One copy of the Statement of Intention to Improve shall be retained by the Building Official until a permit copy for improvement on the site is approved or one year has elapsed; a second copy shall be returned to the Owner for his use in final siting and design of his improvement. Assignments of the RFD elevations at all locations shall be made from profiles and/or cross sections provided by the Army Corps of Engineers, SCS, USGS. This information shall be open to public examination at all reasonable times.

FPR Section 205.2 is amended to read as follows:

Permits Required: No person, firm or corporation shall erect, construct, alter, repair, move, remove, convert, or demolish any building or structure or any part thereof, or make any other improvement within the structure or any part thereof, or make any other improvement within the Flood Hazard Area(s), or cause same to be done, without first obtaining a separate building

flood proofing permit for any such improvement from the Building Official. Ordinary minor repairs may be made with the approval of the Building Official without a permit, provided that such repairs shall not violate any provisions of these Regulations or of "The Building Code".

FPR Section 205.3 No. 2 is amended to read as follows:

Two (2) sets of complete plans and specifications, in addition to plans and specifications required by "The Building Code", except that plans and specifications for any and all proposed improvement in the primary Flood Hazard Area(s) shall be prepared by an engineer or architect licensed by the State to practice as such. All drawings and specifications shall bear the name of the author thereof in his true name, followed by such title as he may be lawfully authorized to use. All plans and sections shall be noted with the proposed flood-proofing class of each space below the RFD including detail drawings of walls and wall openings.

Exception: Plans for Group M Division 1 Occupancies need not be prepared by a licensed architect or engineer.

FPR Section 205.3 No. 3 is amended to read as follows:

Two (2) copies of the Owner's Contingency Plan, which shall describe in detail all procedures for temporary placement and removal or contingent protection proposed items in spaces affected by these Regulations including:

(a) Plans and schedules for items to be removed and locations of places above the RFD to which they will be removed if these contents violate restrictions associated with the flood-proofing class of the space in which they are placed temporarily, including specific organizational responsibilities.

(b) Procedures, materials and equipment for protecting items required to have protection by their flood-proofing class, but for which this protection is proposed to be provided contingently, including specific organizational responsibilities for accomplishing this protection.

Waivers of restrictions implicitly requested by submission of the Owner's Contingency Plan may be granted by the Building Official as provided by 1101.2.

FPR Section 209.1 is amended to read as follows:

New Building and Structures: Every building or structure hereafter erected, that is located in the primary Flood Hazard Area(s) where the ground surface is two (2) feet or more below the RFD, or where flood water velocities may exceed five (5) feet per second, shall be provided with an enclosed refuge space above the RFD, of sufficient area to provide for the occupancy load with a minimum of 12 square feet per person. It shall be provided with one or more exits through the exterior walls above the RFD to an exterior platform and stairway not less than three (3) feet wide.

FPR Section 209.3 is amended to read as follows:

Use of Space Below the Regulatory Flood Datum: No floor level or portion of the building or structure that is below the RFD regardless of structure or space classification shall be used as habitable space, or for storage of any property, materials, or equipment that might constitute a safety hazard when contacted by flood waters.

FPR Section 210.7 is amended to read as follows:

Placard Types: Placards shall be white rigid plastic or other non-water susceptible materials eight (8) inches long and twelve (12) inches wide, and shall have printed thereon in black letters the information shown in Figure 2.

FPR Section 300.0 is amended by adding a subsection to read as follows:

FPR Section 300.2 Interpretation: For the purpose of these regulations, where definition of terms as set forth in this Chapter conflict in meaning with those as set forth in Minn. Regs. NP 85(c), the latter shall take precedence.

FPR Section 301.2.9 is amended to read as follows:

Habitable space (Room) is space in a structure for living, sleeping, eating or cooking. Bathrooms, toilet compartments, closets, halls, storage rooms, laundry or utility space, and similar areas, are not considered habitable space.

FPR Section 301.4.1 is amended to read as follows:

Building Code: The State Building Code setting forth standards for the construction, addition and modification and repair of buildings and other structures for the purpose of protecting health, safety, and general welfare of the public.

FPR Section 402.1 (Table 2) is amended to read as follows:

General: Table 2 indicates the various degrees of protection required to permit use of spaces for each flood-proofing; the chart in itself shall not be construed as being exhaustive with respect to all requirements imposed by these Regulations. In any disputes arising over the interpretation of this chart, the written provisions of these Regulations shall be considered as definitive.

Table 2
SPACE CLASSIFICATION CHART

FLOOD-PROOFING CLASSIFICATION OF SPACES
MINIMUM REQUIREMENTS

Flood-Proofing Classes	Water-Proofing	Structural Loads	Closure of Openings	Internal Flooding & Draining	Flooring	Walls and Ceilings	Contacts	Electrical	Mechanical
W1 Completely Dry	Type A	Class 1	Type 1	See Chapter 8	Class 1	Class 1	Class 1	See Chapter 12	See Chapter 13
W2 Essentially Dry	Type B	Class 1	Type 2		Class 2	Class 2	Class 2		
W3 Flooded with Potable Water	Type A	Class 2	Type 3		Class 3	Class 3	Class 3		
W4 Flooded with Flood Water	Type C	Class 3	Type 4		Class 4	Class 4	Class 4		
W5 Non-Flood-Proofing	–	–	Type 5		Class 5	Class 5	Class 5		

FPR Section 612.2.1 is amended to read as follows:

Natural Terrain: In addition to the requirements of "The Building Code", the building shall be located not less than fifteen (15) feet back from the line of incidence of the RFD on the ground, foundation design shall take into consideration the effects of soil saturation on the performance of the foundations, the effects of flood waters on slope stability shall be investigated, normal access to the building shall be by direct connections with areas above the RFD and all utility service lines shall be designated and constructed as required to protect the building and/or its components from damage or failure during a flooding event to the RFD.

FPR Section 612.2.2 is amended to read as follows:

Building on Fill: The building and all parts thereof may be constructed above the RFD on an earth fill. Prior to placement of any fill or embankment materials, the area upon which fill is to be placed, including a five-foot strip measured horizontally beyond and contiguous to the toe line of the fill, shall be cleared of standing trees and snags, stumps, brush, down timber, logs and other growth, and all objects including structures on or above the ground

surface or partially burned. The area shall be stripped of topsoil and all other material which is considered unsuitable by the Building Official as foundation material. All combustible and noncombustible materials and debris from the clearing, grubbing and stripping operations shall be removed from the proposed fill area and disposed of at locations above the RFD and/or in the manner approved by the Building Official. Fill material shall be of a selected type, preferable granular and free-draining placed in compacted layers. Fill selection and placement shall recognize the effects of saturation from flood waters on slope stability, uniform and differential settlement, and scour potential.

The minimum elevation of the top slope for the fill section shall be no more than one foot below the RFD. Minimum distance from any point of the building perimeter to the top of the fill slope shall be either fifteen (15) feet or twice the depth of fill at that point, whichever is the greater distance. This requirement does not apply to roadways, driveways, playgrounds and other related features which are not integral and functional parts of the building proper. Fill slopes for granular materials shall be not steeper than one vertical on one and one-half horizontal, unless substantiating data justifying steeper slopes are submitted to the Building Official and approved. For slopes exposed to flood velocities of less than five (5) feet per second, grass or vine cover, weeds, bushes and similar vegetation undergrowth will be considered to provide adequate scour protection.

FPR Section 802.1 is amended to read as follows:

Applicability: Spaces to be intentionally flooded with flood water (W4) shall be provided with the necessary equipment, devices, piping, controls, etc. necessary for automatic flooding during the flood event and drainage system(s) shall utilize approved piping materials and have sufficient capacity for raising or lowering the internal water level at a rate comparable to the anticipated rate of rise and fall of a flood that would reach the RFD. These pipe systems shall be directly connected to the external flood waters to maintain a balanced internal and external water pressure condition. Provisions shall be made for filling the lower portions of the structure first and for interconnections through or around all floors and partitions to prevent unbalanced filling of chambers or parts within the structures. All spaces below the RFD, shall be provided with air vents extending to at least three (3) feet above the elevation of the RFD to prevent the trapping of air by the rising water surface. All openings to the filling and drainage systems shall be protected by screens or grills to prevent the entry or nesting of rodents or birds in the systems.

FPR Section 1101.3.2 is amended by changing the "Contents Class" of Food Products from X to 1.

FPR Section 1301.2.1 is amended to read as follows:

Heating systems utilizing gas or oil fired furnaces shall have a float operated automatic control valve installed in the fuel supply line which shall be set to operate when flood waters reach an elevation equal to the floor level of the space where furnace equipment is installed. A manually operated gate valve

that can be operated from a location above the RFD shall be provided in the fuel supply line to serve as a supplementary safety provision for fuel cutoff. The heating equipment and fuel storage tanks shall be mounted on and securely anchored to a foundation pad or pads of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. As an alternate means of protection, elevation of heating equipment and fuel storage tanks above the RFD on platforms or by suspension from overhead structural systems will be permitted. All unfired pressure vessels will be accorded similar treatment. Fuel lines shall be attached to furnaces by means of flexible or swing type couplings. All heating equipment and fuel storage tanks shall be vented to an elevation of at least three (3) feet above the RFD. Air supply for combustion shall be furnished if required for systems installed in W1 or W2 spaces and piping or duct work for each purpose shall be terminated at least three (3) feet above the RFD.

FPR Section 1302.2.2 is amended to read as follows:

Where the state of dryness of a space is dependent on a sump pump system, or where the stability of a structure during a flood event depends on the relief of up-lift pressures on building components, all interior storm water drainage or seepage, appliance drainage, and underslab drain tile systems shall be directly connected to a sump (pump) and discharged at an elevation at least three (3) feet above the RFD.

FPR Section 1302.2.3.1 is amended to read as follows:

All vents shall extend to an elevation of at least three (3) feet above the RFD.

FPR Section 1302.3 is amended to read as follows:

Sewage Disposal/Treatment. Individual sewage disposal and/or treatment facilities will be permitted in a Flood Hazard Area but only at locations where connection with a public sewer systems is not permissible or feasible. Such facilities shall conform to applicable standards, criteria, rules and regulations of the Minnesota Department of Health and Pollution Control Agency in terms of size, construction, use and maintenance and with standards and criteria of the Minnesota Department of Natural Resources regarding setbacks from normal high water mark of a water-course in accordance with the public water classification.

FPR Section 1302.3.1 regarding cesspools/sewage disposals has been amended by deleting this section in its entirety.

FPR Section 1302.3.2 regarding seepage pits has been amended by deleting this section in its entirety.

FPR Section 1302.4.1 is amended to read as follows:

Water supply wells, tanks, filters, softeners, heaters, and all appliances located below the RFD shall be protected against contamination by covers, walls, copings, or castings. All vents shall be extended to a minimum elevation of three (3) feet above the RFD.

SPECIAL PROVISIONS
for the
CITY OF ROCHESTER

The following sections of the Uniform Building Code are amended to read as follows:

UBC 3802(b)6 In Group H, Divisions 1 and 2 Occupancies having an area of more than 1,500 square feet; in Group H, Division 3 Occupancies having an area of more than 3,000 square feet; and in Group H, Division 4 Occupancies more than one story in height, or exceeding 8,400 square feet in floor area located in Zone No. 1 or No. 2 exceeding 20,200 square feet in floor area located in Zone No. 3. The area and height increases specified in Section No. 506 and No. 507 shall be permitted.

In rooms where flammable or combustible liquids are stored or handled in excess of the quantities set forth in Table No. 10-A, or any combination of flammable liquids totaling 240 gallons, is defined in the Fire Code.

For special provisions on hazardous chemicals and magnesium, and calcium carbide, see Fire Code.

UBC 3802(b)8 In retail sales rooms, classed as Group B, Division 2 Occupancies where the floor area exceeds 12,000 square feet on any floor or 24,000 square feet on all floors; however, the area and height increases specified in Sections 506(c) and 507 shall be permitted. In Group B Occupancies exceeding 13,500 square feet in floor area located in Zone No. 1 or No. 2, or when of Type V construction exceeding 10,500 square feet of floor area located in Zone No. 2, or exceeding 20,200 square feet in floor area located in Zone No. 3. The area and height increases specified in Section No. 506 and No. 507 shall be permitted.

EXCEPTION: Open parking garages.

UBC 3802(b)12 In Group R1 Occupancies exceeding 20,200 square feet in floor area or four stories in height located in Zone No. 1 or No. 2, or exceeding 30,000 square feet in floor area located in Zone No. 3. The area and height increases specified in Section No. 506 and No. 507 shall be permitted.

APPENDIX A

Technical Requirements for Fallout Shelters

I. General. The purpose of this technical memorandum is to establish official standards for fallout shelters.

II. Terminology.

A. Protection factor. A factor used to express the relation between the amount of fallout gamma radiation that would be received by an unprotected person and the amount that would be received by one in a shelter. For example, an occupant of a shelter with a PF of 40 would be exposed to a dose rate 1/40 (or 2½%) of the rate to which he would be exposed if his location were unprotected.

B. Fallout shelter. A structure, room or space that protects its occupants from fallout gamma radiation, with a protection factor of at least 40.

III. Radiation shielding.

A. Computation of protection factors shall be made by methods acceptable to the Office of Civil Defense.

B. In the calculation of the protection factor, the radiation dose contribution to the shelter occupants coming from the entranceways, ventilation ducts or other openings in the shelter's barriers shall be considered.

IV. Shielding requirements. Detailed DoD studies of the lifesaving potential of fallout shelters indicate that for the current time-frame and for the foreseeable future, shelters with a protection factor of 40 could save over 90% of those persons who would otherwise die if unprotected against potential lethal radiation levels. Therefore, design and construction objectives are:

A. Shelters for the general population. In modifications to existing buildings and in new construction, protection factors and shelter areas should be maximized to the extent possible, at nominal or no cost, using slanting techniques (See TM 64-2). Although minimum protection for a shelter area should be at least PF 40, the objective is to obtain the best protection factor possible. Computations indicate that decreasing returns in added lives saved per added dollar invested are obtained as PF's are increased significantly above 40. On a nationwide basis, therefore, it would provide better lifesaving potential per dollar, for the same dollar expenditure, to obtain more shelter space of lower PF than only a few shelter spaces with very high PF.

B. Shelters for emergency operational personnel. As it is anticipated that personnel with emergency functions may have to expose themselves to dangerous radiation levels during the performance of their duties, it is desirable to obtain the best possible protection factors for emergency operating centers

or shelters housing emergency operational personnel, with an acceptable minimum objective of at least 100 PF.

C. Recognizing that in many design and construction projects it may be physically difficult or expensive to attain these minimum shielding objectives, it is still a worthwhile objective to increase protection factors to any level. Under many potential levels of radiation exposure, even these lower protection factors will save lives or minimize illness.

V. Space and ventilation requirements*.

A. Ten square feet of shelter floor area per person shall be provided.

B. At least 65 cubic feet of space per person shall be provided.

C. If the shelter capacity is based on minimum space requirements, then at least 3 cubic feet of fresh air per minute per person are required.

D. Shelter capacity or occupancy time may be limited by the volume of the room and not by its area. This is particularly true if mechanical ventilation is inadequate. When ventilation is limited, the following table can be used for determining the relation of space requirements to ventilation:

Time for one complete air change (minutes)**	Volume of space required per person (Cu. Ft.)
1,000 or more	500
600	450
400	400
200	300
100	200
60	150
35	100
22	65

**Computed as a ratio:

$$\frac{\text{Net volume of space (Cu. Ft.)}}{\text{Fresh air supply (cfm)}}$$

E. No filters are required on mechanical ventilation systems other than those necessary for the normal daily use of the space.

F. In general, incremental costs of fixed ventilation equipment to meet shelter requirements shall not exceed $2.50 per shelter space. The estimated cost of ventilating the shelter with packaged ventilation equipment shall be approved by the Office of Civil Defense.

*NOTE: In geographic areas where temperature or humidity are excessive, the minimum ventilation criteria as included above may require augmentation to improve habitability. Professional judgment should be exercised by the architect or engineer to optimize habitability within budget limitations.

VI. Construction requirements.

A. In general, conventional methods of design and construction for concrete, wood, steel, brick, structural tile and other products will be followed. Allowable stresses and/or load factors as defined in the applicable codes shall be used.

B. The structure shall be designed for a useful life of at least 10 years.

C. At least one unit of access and egress width should be provided for every 200 shelter occupants (a unit width is 22 inches, the space required for free travel of one aisle of persons). In no case shall a single passage width be less than 24 inches; nor shall there be less than two widely separated means of egress from each building. Emergency-type hatchways may be used as a means of egress. The passage shall be designed so that any normal-size adult can readily enter or leave the main shelter chamber.

D. In areas subject to high-ground water conditions, provisions shall be made to prevent flotation of undergound shelters.

E. Provisions shall be made to insure the shelter interior will remain reasonably dry.

F. To the extent practicable, hazardous utility lines such as steam, gas, etc., should not be located in or near the shelter area unless provision is made to control such hazards before the shelter is occupied.

G. All shelters shall be constructed to minimize the danger of fire from both external and internal sources.

VII. Services.

A. Provisions shall be made for the storage of basic shelter supplies by alloting 1½ cubic feet per person. This volume may be reduced to 0.6 cubic feet per person if the standard OCD 17½ gallon water drums are not utilized. The live load attributable to placing these supplies should be considered. Fallout shelters with a capacity of 50 or more persons, which have been made available to the public should be stocked with:

1. Water–to provide each person with a minimum of 3½ gallons of water.

2. Food–special crackers, biscuits, or wafers, etc., to provide 10,000 calories per person, deducting comparable food already available in the building.

3. Medical care kits.

4. Sanitation kits which include toilet tissue, sanitary napkins, toilet seat and commode chemicals. Empty water containers convert to commodes.

5. Radiation detection instruments.

B. Water supply. An adequate supply of water from a suitable well, water trapped in the piping of the facility, or water storage tanks should be substituted, wherever feasible, for storage of drinking water in the standard OCD 17½ gallon water drums.

C. Sanitation. Toilets may be provided on the basis of one per 50 occupants. In lieu of VII A 4 above, other austere provisions, based on economic considerations may be made for the disposal of garbage, trash, and human waste. Fifty percent of the toilets may be outside the shelter area, in other parts of the building, provided they are readily accessible without hazardous exposure to fallout gamma radiation.

D. Electrical power. It is assumed that normal electrical power will be available, therefore emergency generators are not required. No special lighting levels are required in fallout shelters. The following levels are deemed adequate for emergency occupancies:

1. Sleeping areas—2-foot candles at floor level.

2. Activity areas—5 foot candles at floor level.

3. Administrative and medical areas—20 foot candles at desk level.

Legal basis for the recommendations: Case and statutory law establish clearly that building codes are enacted as city ordinances under authority conferred on the municipality by the legislature to adopt and enforce laws pursuant to the state's police power. They must be reasonable and not arbitrary and must tend to promote the public health, safety, and welfare.

In a legal sense, building code standards may be classified as mandatory because a violation causes specific sanctions or remedies to be invoked to assure compliance. These may take the form of denial of permit, notice to vacate, suit for injunction, or a criminal penalty in the form of a fine. However, standards may be regarded as permissive in the sense that they do not obligate the owner to include spaces or facilities for particular uses in the building to be constructed, but rather, require compliance with building code standards of such spaces or facilities if actually constructed.

Fallout shelter standards as enacted by the proposed codes article are properly classified as permissive since they invoke no legal obligation on the building owner to construct or provide fallout shelter space. The proposed article does establish mandatory, enforceable standards, however, where the owner voluntarily undertakes to construct, designate, or use spaces for fallout shelter purposes. No separate or special penalty provision is made a part of the article, since a violation of it will bring into play the enforcement powers and procedures under the applicable code provisions generally. This approach will not lead to any special enforcement difficulties and is reinforced by a clear statement as to the purpose of the proposed permissive fallout shelter article.

The proposed article is designed especially to meet the obvious need for administrative relaxation of general building code provisions, making them inapplicable to fallout shelter spaces when occupied in time of national emergency.

This objective is achieved by a simple method of expressly confining the scope of the article (and its standards) to those spaces which are constructed, designated, and used for fallout shelter protection in a time of national emergency or reasonable periods of drill and instruction. During such times, the fallout shelter article standards apply exclusively. If the fallout shelter space is used for normal purposes at other times, the appropriate other sections of the code apply with respect to construction and occupancy.

This approach avoids the legal complications inherent in the use of separate provisions authorizing enforcement officials to relax certain code provisions in times of emergency. That alternative presents special problems in defining the circumstances and extent of administrative discretion to be exercised by the variously authorized and organized municipal enforcement offices of the nation.

Achievement of this objective by expressly confining and stating the scope of the shelter article clearly offers the best prospect for legal and uniform administration of building code standards during a national emergency. Coupled with the affirmative statement that no provisions of the shelter article are intended to prohibit dual-occupancy use, this scope provision should encourage, and make legitimate, fallout shelter construction and designation. It also is consistent with the project purpose: to design a permissive article establishing minimum standards as measured by Office of Civil Defense minimum technical requirements.

Generalized Permissive Building Code Article
Regulations Governing Fallout Shelters

This article shall establish the minimum criteria which must be met before a building or building space can be constructed, occupied, used, or designated a fallout shelter.

Scope and applicability. The scope of this article extends to building spaces designated for use as fallout shelters including periods of drill and instruction for this purpose.

Definitions:

Fallout shelter—A fallout shelter is any room, structure, or space designated as such and providing its occupants with protection at a minimum protection factor of forty (40) from gamma radiation from fallout from a nuclear explosion as determined by a Qualified Fallout Shelter Analyst certified by the Office of Civil Defense. Area used for storage of shelter supplies need not have a protection factor of 40.

Dual-use fallout shelter—A dual-use fallout shelter is a fallout shelter having a normal, routine use and occupancy as well as an emergency use as a fallout shelter.

Single purpose fallout shelter—A single purpose fallout shelter is one having no use or occupancy except as a fallout shelter.

Protection factor—A factor used to express the relation between the amount of fallout gamma radiation that would be received by an unprotected person and the amount that would be received by one in a shelter.

Unit of egress width—A unit of egress width is 22 inches.

General. Nothing in these regulations shall be construed as preventing the dual use or multiple use of normal occupancy space as fallout shelter space, providing the minimum requirements for each use are met.

Mixed occupancy. The occupancy classification shall be determined by the normal use of the building. When a normal-use space is designed to have an emergency use as a fallout shelter in addition to the normal use, the most restrictive requirements for all such uses shall be met.

Occupancy separation. No requirements.

Space and ventilation. A minimum of ten (10) square feet of net floor area shall be provided per shelter occupant. Partitions, columns, and area for storage of Federal shelter supplies may also be included in net area. A minimum of sixty-five (65) cubic feet of volume shall be provided per shelter occupant. A minimum of three (3) cubic feet of fresh air per minute per person shall be provided.

Shelter capacity also shall be limited by the volume of the room or space. The following table shall be used to determine capacity of room or space in relation to available ventilation:

TIME FOR COMPLETE AIR CHANGE (MINUTES)*	VOLUME OF SPACE/ PERSON (CU. FT.)
1000 or more	500
600	450
400	400
200	300
100	200
60	150
35	100
22	65

*Computed as a ratio:

$$\frac{\text{net volume of space (cu. ft.)}}{\text{Fresh air supply (cfm)}}$$

Windows. No requirements.

Illumination. No special lighting levels are required.

Exit facilities. There shall be no fewer than two widely spaced exits from a fallout shelter, leading directly to other spaces of the building or outdoors. Exits from the fallout shelter shall aggregate at least one unit of egress width for every 200 shelter occupants. In no case shall a single exit be less than 24" wide.

Fire resistive construction requirements. No requirements.

Flame spread ratings of interior surfaces.

Div. I Dual-use fallout shelters. No requirement.

Div. II Single-purpose fallout shelters. Interior surfaces shall have a flame spread rating not exceeding 200.

Minimum design loads.

Div. I Dual-use fallout shelters. In the case of dual-use fallout shelters, design live load required for the normal use shall govern, except that concentrated loads shall be considered.

Div. II Single-purpose fallout shelters. Minimum live load for floor design in single-purpose fallout shelters shall be 40 lbs. per sq. ft. except that concentrated loads shall be considered.

Sanitation. Toilets, either flush type operating from the normal water supply system, or chemical or other types, shall be provided on the basis of one toilet per 50 fallout shelter occupants. Fifty per cent (50%) of the toilets may be provided outside the fallout shelter area. Empty water containers may be considered as fulfilling this requirement.

APPENDIX B

Variations of Snow Loads

The minimum snow loads for the design of both ordinary and multiple series roofs, either flat, pitched or curved, shall be determined by multiplying the appropriate snow load given in Section 2305(c) by the appropriate coefficients Cs (See Figures 1, 2, 3 and 4). The full intensity of the roof snow load shall be applied to any one contiguous portion of the roof area if it produces a more unfavorable effect than the full intensity applied over the entire roof area. The basic snow load coefficient Cs shall be increased or decreased in accordance with the following conditions:

A. Decreases.

1. A decrease (due to slide-off of snow load) on the horizontal projection of pitched roofs, of one pound per square foot for each degree, by which the slope angle exceeds 20 degrees. In no case shall the allowable design load be less than 20 pounds per square foot.

TABLE OF PITCH VS. DEGREE:

PITCH	DEGREES
2/12	9°-28'
2½/12	11°-46'
3/12	14°-2'
3½/12	16°-15½'
4/12	18°-26'
4½/12	20°-33'
5/12	22°-37'
5½/12	24°-37'
6/12	26°-34'

2. A decrease of 20 per cent of the basic uniform snow load may be used for rounded (arch) roofs with a ratio of rise to span between 1/8 and 3/8. Roofs with rise to span ratio equal to or greater than 3/8, the basic uniform snow load may be reduced 40 per cent. In no case shall the allowable uniform snow load be less than 20 pounds per square foot.

B. Increases. The basic roof loads shall be increased for the following conditions:

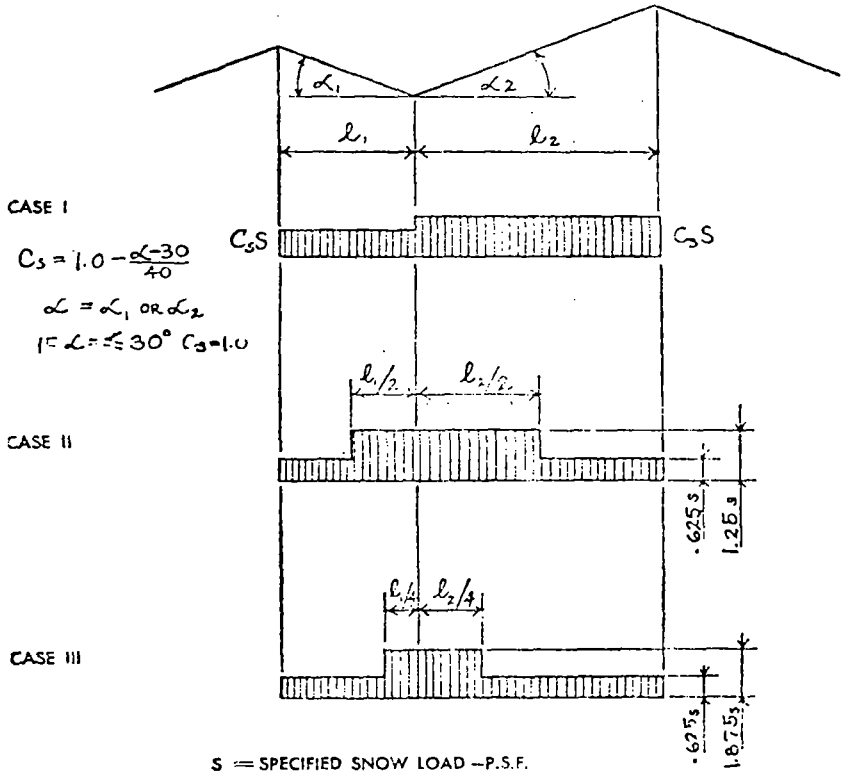
1. Roof Valley Condition in accordance with Figure No. 1 and applicable load cases.

2. Roof areas abutting vertical walls, of adjacent buildings in accordance with Figure No. 2 and applicable formulas.

3. Lower level roof areas abutting sloping upper roof areas in accordance with Figure No. 3 and applicable descriptive conditions.

4. Roof areas adjacent to or containing projections and/or obstructions in accordance with Figure No. 4 and applicable formulas.

NOTE: Figures No. 1, No. 2, No. 3 and No. 4 as shown.

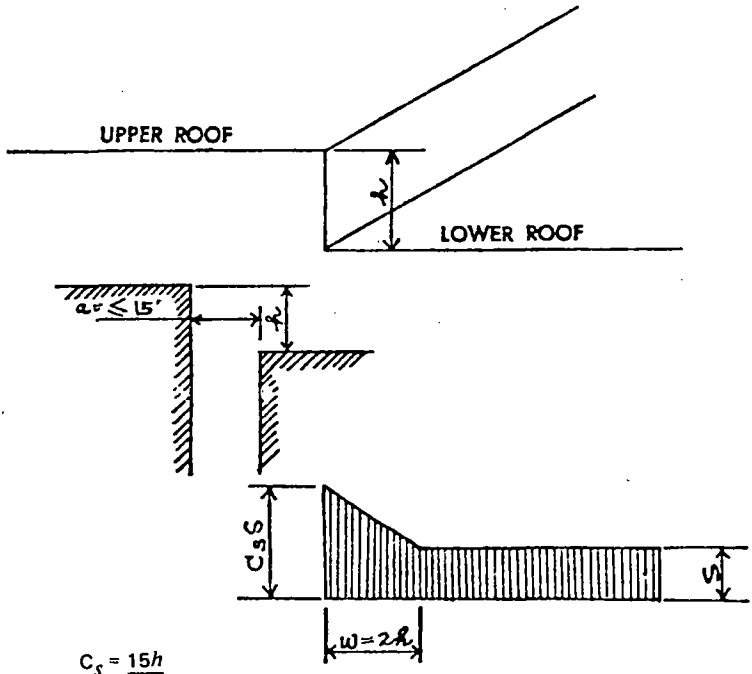


S = SPECIFIED SNOW LOAD – P.S.F.
C = COEF. OF INCREASED SNOW LOAD DUE TO LOCATION

$\beta = \frac{\alpha_1 + \alpha_2}{2}$

IF $\beta \leq 10°$ USE CASE I
IF $10° < \beta < 20°$ USE CASE I & II
IF $\beta \geq 20°$ USE CASE I, II & III

FIGURE NO. 1
VALLEY AREA OF SLOPED ROOFS



$C_S = \frac{15h}{s}$

w (MINIMUM) = 10 FT.
w (MAXIMUM) = 30 FT.

IF $\frac{15h}{s} < 1.0$ $C_S = 1.0$

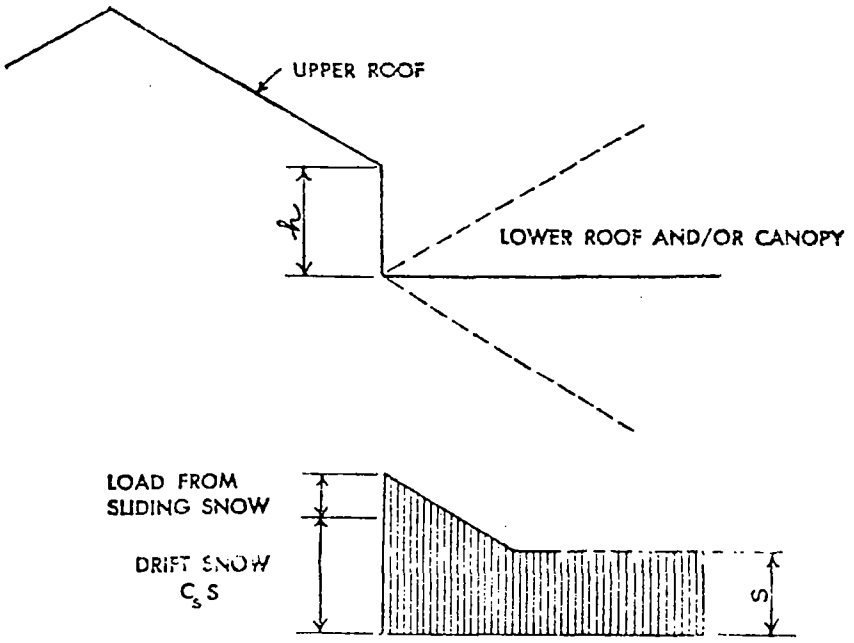
IF $\frac{15h}{s} > 3.0$ $C_S = 3.0$

IF $h < 5$ FT., $w = 10$ FT.

IF $h > 15$ FT., $w = 30$ FT.

h = HEIGHT DIFFERENCE IN ROOFS IN FEET
w = WIDTH OF DRIFT IN FEET
a = DISTANCE BETWEEN BUILDINGS IN FEET
s = SPECIFIED SNOW LOAD IN P.S.F.
C_S = COEFFICIENT OF INCREASED SHOW LOAD

FIGURE NO. 2
LOWER LEVEL OF MULTI-LEVEL ROOFS

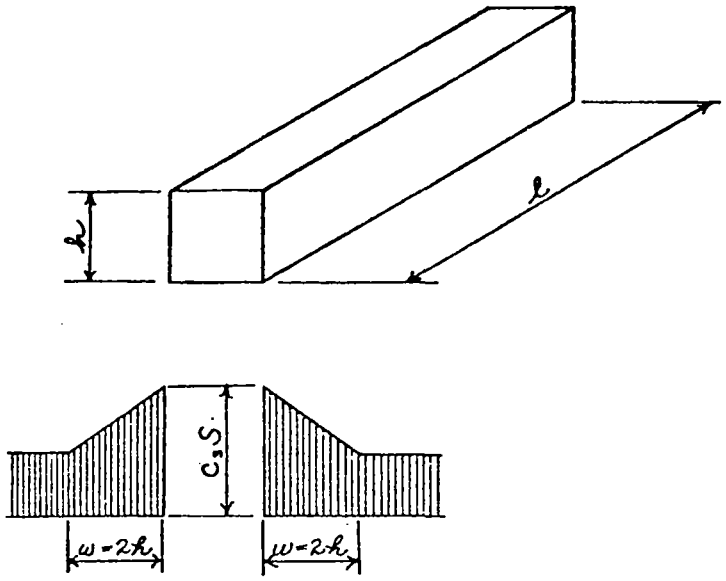


DESIGN LOWER ROOF OR CANOPY FOR LOADS ACCORDING TO FIGURE II + 50% of DESIGN LOAD FROM UPPER. THE DISTRIBUTION SHOULD BE MADE DEPENDING ON THE RELATIVE SIZES, SLOPES AND POSITIONS OF THE TWO ROOFS.

IF, BECAUSE OF A RELATIVELY SMALL LOWER ROOF OR CANOPY, ALL OF THE SLIDING SNOW CANNOT BE RETAINED, APPROPRIATE REDUCTIONS MAY BE MADE. THE DENSITY OF SLIDING SNOW MAY BE RATHER HIGH.

DESIGN UPPER ROOF AS THOUGH IT IS A SINGLE SPAN BUILDING.

FIGURE NO. 3
LOWER ROOF WITH SLOPING UPPER ROOF



w (MINIMUM) = 10 FEET
w (MAXIMUM) = 30 FEET

$$C_s = \frac{10h}{s}$$

IF $\frac{10h}{s} < 1.0$ $C_s = 1.0$

IF $\frac{10h}{s} > 2.5$ $C_s = 2.5$

IF $l < \frac{s}{4.8}$ $C_s = 1.0$

IF $h < 5$ FEET $w = 10$ FEET
IF $h > 15$ FEET $w = 30$ FEET

h = HEIGHT OF OBSTRUCTION IN FEET
w = WIDTH OF DRIFT IN FEET
l = LENGTH OF OBSTRUCTION OR PROJECTION IN FEET
s = SPECIFIED SNOW LOAD IN P.S.F.
c = COEFFICIENT OF INCREASED SNOW LOAD

FIGURE NO. 4
PROJECTIONS AND OBSTRUCTIONS

APPENDIX C

Abbreviations and Addresses of Technical Associations

AA	Aluminum Association 818 Connecticut Ave. N.W. Washington, D.C. 20006
ACI	American Concrete Institute 18263 W. McNichols Road Detroit, Michigan 48219
AGA	American Gas Association 1515 Wilson Blvd. Arlington, VA 22209
AIEE	American Institute of Electrical Engineers 33 West 39th Street New York, New York 10018
AISC	American Institute of Steel Construction 101 Park Avenue New York, New York 10017
AITC	American Institute of Timber Construction 333 West Hampden Avenue Englewood, Colorado 80110
AInsA	American Insurance Association 85 John Street New York, New York 10038
AISI	American Iron and Steel Institute 150 East 42nd Street New York, New York 10017
ANSI	American National Standards Institute Formerly (United States of America Standards Institute) Formerly (American Standards Association) 1430 Broadway New York, New York 10018
API	American Petroleum Institute 1625 K Street NW Washington, D. C. 20005
APA	American Plywood Association P.O. Box 11700 Tacoma, Washington 98401

APHA	American Public Health Association 1790 Broadway New York, New York 10017
ARI	Air-Conditioning and Refrigeration Institute 1815 North Fort Myer Drive Arlington, Virginia 22209
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers United Engineering Center 345 East 47th Street New York, New York 10017
ASME	American Society of Mechanical Engineers United Engineering Center 345 East 47th Street New York, New York 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, Pennsylvania 19103
AWPI	American Wood Preservers Institute 2600 Virginia Avenue NW Washington, D. C. 20037
AWS	American Welding Society United Engineering Center 345 East 47th Street New York, New York 10017 and 33 West 39th Street New York, New York 10018
AWWA	American Water Works Association 2 Park Avenue New York, New York 10016
FMED	Factory Mutual Engineering Division Standards - Laboratories Department 1151 Boston - Providence Turnpike Norwood, Massachusetts 02062
FS	Federal Specifications Superintendent of Documents Department of Commerce Government Printing Office Washington, D. C. 20234

GPO	Superintendent of Documents Government Printing Office Washington, D. C. 20402
HVI	Home Ventilating Institute 230 N. Michigan Ave. Chicago, Ill. 60601
IAPMO	International Association of Plumbing and Mechanical Officials 5032 Alhambra Avenue Los Angeles, California 90032
IBR	Institute of Boiler and Radiator Manufacturers 393 Seventh Avenue–10th Floor New York, New York 10001
ICC	Interstate Commerce Commission 12th Street and Constitution Avenue Washington, D. C. 20423
IIA	Incinerator Institute of America 60 East 42nd Street–Suite 1914 New York, New York 10017
NASFCA	National Automatic Sprinkler and Fire Control Association, Inc. 2 Halland Avenue White Plains, New York 10603
NBS	National Bureau of Standards Department of Commerce Washington, D. C. 20234
NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, Massachusetts 02210
NFPA	National Forest Products Association 1619 Massachusetts Avenue NW Washington, D. C. 20036
NLPGA	National L-P Gas Association 79 West Monroe Street Chicago, Illinois 60603
NOFI	National L-P Gas Association 1301 W. 22nd St. Oak Brook, Ill. 60521

NSFTL	National Sanitation Foundation Testing Laboratory, Inc. School of Public Health P.O. Box 1468 Ann Arbor, Michigan 48106
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, Illinois 60076
PS	Product Standards Section Office Engineering Standards Service National Bureau of Standards Washington, D. C. 20234
SCPI	Structural Clay Products Institute 1520 18th Street NW Washington, D. C. 20036
SFPA	Southern Forest Products Association P.O. Box 52468 New Orleans, Louisiana 70150
SJI	Steel Joist Institute Du Pont Circle Building 1346 Connecticut Avenue NW Washington, D. C. 20036
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc. 8224 Old Courthouse Rd., Tysqne Corner Vienna, VA 22180
TPI	Truss Plate Institute 7100 Baltimore Ave. College Park, Maryland 20740
UL	Underwriters Laboratories, Inc. 207 East Ohio Street, Chicago Illinois 60611 2550 Dundee Road, Box 247, Northbrook, Illinois 60062 1285 Walt Whitman Road Melville, L. I., New York 11749 1655 Scott Lane, Santa Clara, California 95050
USBM	United States Bureau of Mines Department of Interior Washington, D. C. 20240
USDA	United States Department of Agriculture Washington, D. C. 20251
USDC	United States Department of Commerce Constitution Division Washington, D. C. 20225

APPENDIX D

Chapter 41

Building Security

Purpose

Sec. 4101. The purpose of this Chapter is to provide minimum standards of design, construction and quality of materials for all applicable buildings to safeguard life, property and the public welfare from the perils of burglary and other unlawful trespasses.

Scope

Sec. 4102. The provisions of this Chapter shall apply to all accessible openings into dwelling units or guest rooms of Groups (R-1), (R-3) and (R-4) occupancies.

Limitations

Sec. 4103. Building security methods which will create a hazard to life by obstructing any means of egress or any opening which could be used as an emergency exiting facility shall be prohibited.

The provisions of this Chapter shall not supersede the safety requirements relative to latching or locking devices on exit doors which would be contrary to the provisions of UBC Chapter 33 nor shall the provisions of this Chapter be construed to waive any other provisions of this code.

Definitions

Sec. 4104. For the purposes of this Chapter, certain terms are defined as follows:

ACCESSIBLE OPENING is any opening, or part thereof, in a wall defining the perimeter of a dwelling unit or guest room, which is located within 12 feet (3.63 m) vertically or 6 feet (1.83 m) horizontally of any surface or building appendage which would tend to supply access to said opening from either ground level or adjacent occupancies or structures. This definition also includes openings leading from breezeways, porches or garage areas into dwelling units.

SWINGING DOOR ASSEMBLY is a unit composed of a group of parts or components that make up a closure for a passageway through a wall. For the purposes of this chapter, a door assembly consists of the following parts: door, hinges, locking device or devices, operation contacts (such as handles, knobs, push plates), miscellaneous hardware and closers, the frame, including the head and jambs plus the anchorage devices to the surrounding wall.

HORIZONTAL SLIDING DOOR ASSEMBLY forms a closure for a passageway through a wall and consists of a frame, one or more operative panels that slide (roll) horizontally within the frame and ancillary hardware such as rollers and locking devices. Such assemblies may also contain fixed panels which are fastened to the frame and/or to the wall in which the frame is installed.

WINDOW ASSEMBLY is a unit composed of a group of parts or components that make up a closure for an opening in a wall to control light, air and other elements, and which normally includes: glazed sash, hinges or pivots, sash lock, sash operator, window frame, miscellaneous hardware and the anchorage between the window and the wall.

For additional definitions, see UBC Standards No. 41-1 and No. 41-2.

Swinging Doors

Sec. 4105. (a) General. All accessible prime swinging door assemblies shall be designed, constructed and installed so that, when the locked position they shall not permit entry when subjected to the forces shown in Table 41-A and tested in accordance with UBC Standard No. 41-1 Part A.

(b) Entry Vision. All entry doors to dwelling units or guest rooms shall be arranged so that the occupant has a view of the area immediately outside the door without opening the door. Such view may be provided through approved view ports or glazed openings when provided in compliance with UBC Chapter 33 and Sections 4105(i) and 4107 of this Chapter.

(c) Frames/Jambs. Door jambs shall be installed with solid backing in such a manner that no voids exist between the strike jamb and the frame opening for a vertical distance of 6 inches (150 mm) each side of the strike.

1. Hollow metal frames shall be filled with concrete or similar noncrushable substance on the strike side of the frame.

2. In wood framing, horizontal blocking shall be placed between studs at door lock height for 2 stud spaces each side of the door opening. Trimmers shall be full length from the header to the floor with solid backing against sole plates.

3. Jambs for inswinging doors shall have the stop and jamb of one piece or equivalent construction.

(d) Hinges. Hinges for outswinging doors shall be equipped with nonremovable hinge pins or a mechanical interlock to preclude removal of the door from the exterior by removing the hinge pins. In wood framing, door frames shall be shimmed behind the hinges and such hinges shall be mounted with a minimum of 2 No. 8 size screws, or equivalent, penetrating at least 2 inches (5cm) into solid backing beyond the surface to which the hinge is attached.

(e) Bolts and Latches. A minimum of one deadlocking bolt and one deadlocking latch, or equivalent, shall be provided for all accessible single swinging doors. Such bolts shall have minimum projections of 1 inch (25 mm) and such latches shall have minimum projections of 1/2 inch (12 mm).

1. Pairs of swinging doors shall have the inactive leaf secured by vertical throw bolts with a minimum projection of 1/2 inch (12 mm), or equivalent, and the active leaf shall be subject to the same provisions as for single swinging doors.

Exception: Doors connecting directly between dwelling units or guest rooms shall be equipped with a minimum of one deadlocking bolt which shall be key operated from both sides or equivalent.

(f) Strikes. Metal strikes shall be required for all locking devices and shall have a minimum thickness of .062 inches (1.5 mm). In wood framing, such strikes shall be mounted with a minimum of 2 No. 8 size screws, or equivalent, penetrating at least 2 inches (5 cm) into solid backing beyond the surface to which the strike is attached.

1. Strikes used for dead latches shall not allow the dead-latch plunger to enter the strike hole with the latch after installation.

(g) Lock Activating Devices. Lock cylinders shall be so designed or protected as to preclude disassembly from the exterior by twisting, prying, pulling or other manipulation.

1. When key-in-knob locksets are constructed such that the deadbolt and dead latch are mechanically interconnected, such locksets shall be so designed or protected that the lock cannot be compromised by wrenching the knob from the exterior or knocking the knob off to gain access to the locking means and manipulating the bolt and latch by hand or with the aid of a screwdriver to gain access.

(h) Keying Requirements. Keyed locks, other than master keyed locks, shall have a minimum of 5 tumblers or be of such design as to provide a minimum of 10,000 possible interchange-free combinations. Master-keyed locks shall provide a minimum of 1,000 interchange-free combinations.

1. A system of construction keying must be provided which will insure that the use of construction keys will be precluded after occupancy by a new tenant or resident.

2. All dwelling units or guest rooms grouped within a building or complex shall have access locks keyed differently.

(i) Door Panels and Glazing. Door panels or glazing materials located within 36 inches (900 mm) of the inside lock activating device of an accessible swinging door assembly shall withstand the required impacts in accordance with the appropriate provisions of UBC Standard 41-1 Part A, Sec. 41.1007 (h).

Exceptions: 1. Openings in doors, when such openings do not exceed 2 inches (50 mm) in the smaller dimension.

2. When the glazing material is U.L. Listed Burglary Resisting Glazing Material (UL Standard 972) installed in an approved manner according to manufacturer's specifications.

3. When the opening is protected by approved metal bars or grilles having a pattern such that the minimum dimension of any opening on the bars or grilles does not exceed 2 inches (50 mm).

Horizontal Sliding Doors.

Sec. 4106. (a) General. All accessible prime horizontal sliding doors shall be designed, constructed and installed so that, when in the locked position they shall not permit entry when tested in accordance with UBC Standard No. 41-1 Part B.

Windows

Sec. 4107. (a) General. All accessible prime windows assemblies shall be designed, constructed and installed so that, when in the locked position they shall not permit entry when tested in accordance with UBC Standard No. 41-2.

Exceptions: 1. Fixed windows which are not designed to open; the glazing material of which may be installed in a sash, or may be installed directly into a window frame.

2. Windows located more than 36 inches (900 mm) from the inside lock activating device of a swinging door assembly when such windows have a clear cross section of 96 inches^2 (600 cm^2) or less and have as their smallest dimension a span of less than 6 inches (150 mm).

3. "Windows that are not emergency egress as regulated by UBC Sections 1304 and 1404, may be protected by approved metal bars or grilles having a pattern such that the minimum dimension of any opening in the bars or grilles shall not exceed 2 inches. The windows shall be equipped with a quick-acting release requiring no special knowledge or skill to operate.

Disassembly

Section 4108. All accessible prime door and window assemblies and components shall incorporate no screws, bolts, nails, staples or other mechanical fasteners which are accessible from the exterior and which could be removed by hand with the aid of a knife, screwdriver or pliers within a period of 5 minutes, thus permitting entry by disassembly.

Acceptance

Sec. 4109. The methods of installation and on-site assembly of swinging

door units and other assemblies as described in this Chapter shall be deemed to meet the standards of this Chapter.

All assemblies and components which are otherwise subject to the Standards of this Chapter shall have a label or other identification indicating compliance with the applicable standards.

Exception: Such labeling requirements may be waived and the subject products deemed to qualify where proof of compliance satisfactory to the building official is submitted as per American National Standard Practice for Certification by Producer or Supplier, ANSI Z34.2-1969.

Alternate Security Provisions

Sec. 4110. The provisions of this Chapter are not intended to prevent the use of any device or method of construction not specifically prescribed by this Chapter when such alternate provides equivalent security and has been approved as provided by UBC 106 and UBC 107.

TABLE NO. 41-A SWINGING DOOR ASSEMBLIES[1]

TEST	MEASURE	LEVEL
Static Bolt Lead[2]	Resistance	150 lbf (670 N)
Hinge Pin Tensile Lead[3]	Resistance	50 lbf (225 N)
Jamb/Wall Stiffness[4]	Force to Spread	1350 lbf (6000 N)
	Increase in Lockfront to Strike Space	0.375 In. (9.5mm)
Knob Torque[5]	Resistance (25 N-m)	18.5 lbf-ft
Cylinder Core Lead	Resistance	290 lbf (1300 N)
Knob Impact[5]	Resistance	One blow of 74 ft-lbf (100 J)
Door Impact	Impact resistance at center and panel	2 blows of 59 ft-lbf (80 J)
	Impact resistance at glazing[6]	One blow of 74 ft-lbf (100 J)
Hinge Impact	Impact resistance at hinge	2 blows of 59 ft-lbf (80 J)
Bolt Impact	Impact resistance at bolt	2 blows of 59-lbf (80 J)

[1] For test methods see UBC Standard No. 41-1, Part A.

[2] Minimum projection of 1 In. (25 mm) for bolts and 1/2 In. (12 mm) for latches.

[3] Applies to outswinging doors only.

[4] Bolt of latch must remain in strike.

[5] Applies to key-in-knob locksets where the bolt and the latch are mechanically interconnected such that a single action projects or retracts both.

[6] Does not apply when the glazing starts at a distance of 36 In. (900 mm) or more from the lock.

Note: Lbf = pounds force.

APPENDIX "D"

Add new State Building Code Standards

STATE BUILDING CODE 2 MCAR § 1.10109

STATE BUILDING CODE STANDARD NO. 41-1

TESTS FOR SECURITY OF DOOR ASSEMBLIES

Part A—Swinging Doors

See Section 4105, State Building Code

Scope

Sec. 41.1001. Part A of this Standard covers test methods for swinging door assemblies that are required for building security by the State Building Code.

The wall assembly described in Section 41.1005 is considered suitable for the scope of these methods of test. Wall construction different in dynamic response from that described in Section 41.1005 may require testing according to Section 41.1007(d).

Definitions

Sec. 41.1002. BOLT is a metal bar which, when actuated, is projected (or "thrown") either horizontally or vertically into a retaining member, such as a strike plate, to prevent a door from moving or opening.

BOLT PROJECTION (OR BOLT THROW) is the distance from the edge of the door, at the bolt center line, to the farthest point on the bolt in the projected position, when subjected to end pressure.

COMPONENT, as distinguished from a part, is a subassembly which combines with other components to make up a total door assembly. The prime components of a door assembly include: door, lock, hinges, jamb/wall, jamb/strike and wall.

CYLINDER is the cylindrical subassembly of a lock containing the cylinder core, tumbler mechanism and the keyway. A double cylinder lock is one which has a key-actuated cylinder on both the exterior and interior of the door.

CYLINDER CORE (OR CYLINDER PLUG) is the central part of a cylinder containing the keyway, which is rotated by the key to operate the lock mechanism.

DEADBOLT is a lock bolt which does not have a spring action as opposed to a latch bolt, which does. The deadbolt must be actuated by a key and/or knob or thumb turn and when projected becomes locked against return by end pressure.

DEAD LATCH (OR DEADLOCKING LATCH BOLT) is a spring-actuated latch bolt having a beveled end and incorporating a plunger which, when depressed, automatically lock the projected latch bolt against return by end pressure.

DOOR ASSEMBLY is a unit composed of a group of parts or components which make up a closure for an opening to control passageway through a wall. For the purposes of this standard, a door assembly consists of the following parts: door; hinges; locking device or devices; operation contacts (such as handles, knobs, push plates); miscellaneous hardware and closers; the frame, including the head and jambs plus the anchorage devices to the surrounding wall and a portion of the surrounding wall extending 36 inches (900 mm) from each side of the jambs and 16 inches (400 mm) above the head.

JAMB is a vertical member of a door frame to which the door is secured.

JAMB/STRIKE is that component of a door assembly which receives and holds secure the extended lock bolt; the strike and jamb used together are considered a unit.

JAMB/WALL is that component of a door assembly to which a door is attached and secured; the wall and jamb, used together, are considered a unit.

KEY-IN-KNOB is a lockset having the key cylinder and other lock mechanisms such as a push or turn button contained in the knobs.

LATCH (OR LATCH BOLT) is a beveled, spring-actuated bolt, which may or may not have a deadlocking device.

LOCK (OR LOCKSET) is a keyed device (complete with cylinder, latch or deadbolt mechanism, and trim such as knobs, levers, thumb turns, escutcheons, etc.) for securing a door in a closed position against forced entry. For the purposes of this Standard, a lock does not include the strike plate.

LOCK FRONT is the outer plate through which the locking bolt projects and which is usually flush with the edge of the door.

PART, as distinguished from component, is a unit (or subassembly) which combines with other units to make up a component.

STRIKE is a metal plate attached to, or mortised into, a door or door jamb to receive and to hold a projected latch bolt and/or deadbolt in order to secure the door to the jamb.

SWINGING DOOR is a stile (side) hinged door.

Samples for Testing

Sec. 41.1003. Specimens shall be representative and the construction shall be verified by assembly drawings and bill of materials. Complete manufacturer or fabricator installation instructions and full-size or accurate scale templates for all items or hardware shall be included.

Test Equipment Performance

Sec. 41.1004. (a) Door Ram. The door ram shall be a pendulum system with a cylindrical weight capable of delivering horizontal impacts of 59 ft-lbf (80 J). The striking end of the weight shall be hemispherical and have a diameter of approximately 6 inches (150 mm). The impact nose may be made of any durable impact resistant material such as epoxypolyamide resin.

(b) Component Ram. The component ram shall be a pendulum system capable of delivering horizontal impacts of 74 ft-lbf (100 J). The pendulum weight shall be cylindrical with a maximum diameter of 3 inches (7.6 cm) and a striking end consisting of a 1/4 inch (6 mm) carriage bolt, or equivalent.

(c) Vertical Impactor. The vertical impactor shall be a rigid pendulum system consisting of a weight with a flat rectangular striking surface capable of delivering downward impacts of 74 ft-lbf (100 J).

(d) Torque Applicator. The portable torque applicator shall be capable of delivering and measuring up to 18.5 lbf-ft (25 N-m) of torque to door knobs. The torque-loading adapter shall be designed to grip the knob.

(e) Tension-Loading Device. The tension-loading device shall be capable of delivering and measuring tensile forces of up to 290 lbf (1300 N).

(f) Compression-Loading Device. The compression-loading device shall be capable of delivering and measuring compresive forces of up to 150 lbf (670 N).

(g) Jamb-Spreading Device. The jamb-spreading device shall be capable of delivering to door jambs and measuring spreading forces of up to 1350 lbf (6000 N) with a means of measuring up to 1/2 inch (12 mm) of spread in the door opening. The device shall have on each end either a loading-bearing plate or pressure foot which provides a minimum contact surface of 1-1/2 by 5 inches (38 mm by 125 mm).

(h) Instrument Accuracy. All test monitoring equipment shall be calibrated to an accuracy of ± 5 percent. The impact energy of each pendulum system shall be controlled to within ± 1 percent.

(i) Manipulation Tools. Tools used for manipulation tests of this Standard shall consist of the following: a knife or spatula with a thin blade approximately 1/32 inch (0.8 mm) thick, not more than 1 inch (25 mm) wide and no longer than 6 inches (150 mm); slotted and phillips type screw drivers

not exceeding 10 inches (250 mm) in length; common hand and needle nose pliers not exceeding 8 inches (200 mm) in length; and a piece of stiff steel wire with a diameter of approximately 1/16 inch (1.6 mm) and length of not in excess of 3 feet (900 mm).

Construction and Size

Sec. 41.1005. The construction and size of the test door assemblies, consisting of single doors, doors in pairs, special-purpose doors (such as Dutch doors), jambs and headers, and all hardware components shall be representative of that for which acceptance is desired.

The test fixture for door, door jamb, hinge, lock strike and other components shall consist of a vertical wall section constructed from 2 by 4 wood studs, 16 inches (410 mm) on center with double studding around the rough openings and outer edges of the fixture. The test fixture shall be covered with 1/2 inch (12 mm) exterior grade plywood sheathing on the exterior and 1/2 inch (12 mm) gypsum board on the interior and shall be secured to a supporting fixture and to the laboratory floor such as to simulate the rigidity normally provided to a door assembly in a building by the ceiling, floor and walls.

An alternate test fixture for lockset components consisting of a small door assembly may be used. The frame shall be fabricated from steel angle and plate at least 3/16 inch (5 mm) thick. The test panel shall be 24 inches (600 mm) square and 1-3/4 inches (45 mm) thick, made by bonding thee pieces of plywood together or by cutting a section from 1-3/4 inch (45 mm) solid wood core door. A 2 by 2 by 1/8 inch (50 by 50 by 3 - mm) steel angle shall be bolted to the hinge edge of the door panel, and a removable steel strike plate shall be bolted to the frame at the lock position of the door panel.

The test fixture for static bolt load tests shall consist of a vertical panel fabricated from wood attached to a stable horizontal base. The top edge shall be about 1-3/4 inches (45 mm) thick and the top edge shall be prepared to permit the lockset which is being tested to be mounted in the panel in accordance with the manufacturer's instructions.

Mounting for Test

Sec. 41.1006. Prepare doors and door jambs for the installation of locksets and hinges in conformance with the manufacturer's instructions. Follow the manufacturer's instructions for fastening the jamb to the test fixture described in Section 41.1005.

To test doors, door jambs, hinges, and jamb/strikes as components, install them in the component test fixture described in Section 41.1005. Except when testing hinges, hinge the door with one and one-half pair of 4-1/2 inch (115 mm) steel butt hinges, and fix it in the closed-locked position (at the normal lock point) with a real or simulated latch bolt having sufficient strength and stiffness to prevent it from failing during test. In the absence of other construction specifications, make the clearances on the lock side, hinge

side and top of the door 1/8 ± 1/64 (3.2 ± .04 mm). Clearance at the threshold is not considered critical in these tests.

To test locksets as components, install them in the alternate component test fixture described in Section 41.1005. Fix the test panel in the closed-locked position at the normal locking point. Hinge the test panel with two 4-1/2 inch (115 mm) steel butt hinges.

To test locksets for static bolt load, install them in the test fixture described in Section 41.1005.

Conduct of Tests

Sec. 41.1007. (a) Test Sequence. Perform tests in the same sequence as presented below, as appropriate for the item under test, using new components for each destructive test.

(b) Static Bolt Load Test. To test locks as components, mount the lock in the test fixture described in Section 41.1006. Lock the door lock with the deadbolt and dead latch in the fully projected position. If the lock incorporates a dead latch plunger, attach a 1/4 inch (6.5 mm) spacer to the lock front. Allow the dead latch plunger to project flush with the top of the spacer, and hold it in that position with a piece of tape or by other suitable means.

Place the test fixture and lock in a compression-testing machine, or mount it on a firm, level surface with the compression-loading device directly above it, the loading face parallel to the lock front, and the axis of the hydraulic ram perpendicular to the lock front. Apply an increasing compressive load to the end of the latch bolt or the deadbolt to the required resistance load and note the bolt or latch projection (the distance between the lock front surface to the farthest point on the bolt or latch at the center line). Such projection shall not be less than 1/4 inch (6.5 mm) while under load.

To test for bolt projection, apply end pressure to the projected deadbolt or latch and measure the distance from the lock front surface to the farthest point on the bolt or latch at the center line.

Following the test of a lock incorporating a dead latch, place the strike plate over the latch of a dead latch to determine whether it is possible for both the dead latch and the dead latch plunger to enter the hole in the strike simultaneously.

(c) Hinge Pin Tensile Load. Drill a hole into the end of the exposed hinge pin with a No. 21 drill, centered on and aligned with the axis of the pin to a depth of 0.5 inch (12 mm). Tap the hole with a 10-32 tap and attach the tensile-loading adapter to it with a hardened cap screw. Clamp one leaf of the hinge in a vice so that the hinge pin is in the horizontal plane. Attach the tensile-loading device to a rigid load-bearing support in front of the hinge and align the pulling axis with the axis of the hinge pin. Attach the tensile-loading adapter to the tensile device and apply the required load.

(d) Jamb/Wall Stiffness Test. Prepare the test specimen in accordance with Section 41.1006 using the full-size test fixture. Position the jamb-spreading device between the door jambs at lock height. Apply increasing force as required and measure the space between the lock front and strike.

While the required load is being applied, or the lock front-to-strike distance increased, push or pull on the door to determine whether the deadbolt or dead latch is engaged with the strike.

(e) Knob Torque Test. Prepare the test specimen in accordance with Section 41.1006 and lock the door or test panel in the closed position. Attach the torque-loading adaptor to the knob and connect the torque applicator to it. Alternately subject the knob to a torque of up to the required torque once in both the clockwise and counter-clockwise directions, applying the torque as rapidly as possible. Inspect the lock to determine whether the bolt is retracted from the strike when the torque is applied. If the knob is broken off, attempt to open the door or test panel by manipulating the lock mechanism by hand or with the aid of manipulation tools as described in Section 41.1004(i) (such lock mechanism shall resist manipulation for a period of not less than 5 minutes).

With the door or test panel open, and the deadbolt or dead latch in the projected, locked position, attempt to (1) depress the deadbolt by applying hand pressure to its end or (2) depress latch and dead latch plunger fully, allow the latch to extend, then slowly allow the plunger to project until the last point of dead locking is reached.

(f) Cylinder Core Tension Test. Prepare the test specimen in accordance with Section 41.1006 and lock the door or test panel in the closed position. Using a No. 21 drill, drill a hole in the cylinder core adjacent to the keyway to a minimum depth of 1/2 inch (12 mm). Tap this hole with a 10-32 thread. Attach the tensile-loading device to a rigid load-bearing support in front of the cylinder and align the pulling axis with a 10-32 hardened cap screw fully threaded into the tapped hole. Connect the cylinder tensile-loading device to the adaptor and apply the required tensile force to the cylinder. Following this test, release the load and attempt to open the door or test panel by manipulating an exposed lock mechanism for a period of 5 minutes by hand or with the aid of manipulation tools as described in Section 41.1004(i). If the core or cylinder is not damaged, open the door and test the dead latch and deadbolt for end pressure resistance as in Section 41.1007(e).

(g) Knob Impact Test. Prepare the test specimen in accordance with Section 41.1006 and lock door or test panel in the closed position. Position the vertical impactor so that the pendulum arm is horizontal when the striking weight contacts the top of the door knob, and its center of gravity is in the vertical center-line through the knob. Raise the weight to the height necessary to deliver the required impact and release it. Deliver the required number of impacts to the knob. After each impact, attempt to open the door or test panel by turning the knob, and if the knob is broken off, by manipulating the exposed lock mechanism by hand or with the aid of manipulation

tools as described in Section 41.1004(i). Such lock mechanism shall resist manipulation for a period of not less than 5 minutes. Open the door and test the dead latch and deadbolt for end pressure resistance as in Section 41.1007 (e).

(h) Door Impact Test. Prepare the test specimen in accordance with Section 41.1006, using the full-size test fixture, and lock the door in the closed position. Set up the door ram pendulum weight so that its axis is horizontal, and perpendicular to the face of the door at a point defined by the intersection of the vertical center line of the door and a line of the door and a line from the center of the bolt to the center of the mid-height hinge (or the midpoint between hinges, when the door is hung with two hinges).

Attach to the door, centered on the impact point, a rigid foamed polystyrene impact buffer which has a diameter of 6 inches (150 mm), a thickness of 2 inches (50 mm) and a density of 2 lbs/ft^3 (32 Kg/m^3). Position the door ram such that its striking nose just touches the surface of the buffer when at rest. Pull back the pendulum weight to the height necessary to produce the required impact, and release it. Subject the door to two impacts at each required impact level, attaching a new buffer for each impact. If the door is forced open by the test, without damaging the jamb/strike or lock component, the door specimen fails the test. If the door surface is broken, attempt to reach inside the door and unlock it from the inside.

If the door has one or more recessed panels, subject the one closest to the lock to two impacts at each required impact level. Locate the impact point on the corner of the panel closest to the lock, 3 inches (75 mm) in from the vertical and horizontal edges of the panel. Perform the test as described above, attaching a new impact buffer for each impact. If the panel is broken, attempt to open the door by reaching through the opening and unlocking the door from the inside.

To test glazing panels, set up the component ram pendulum weight so that, at rest, its striking nose just touches the front surface at a point located along a line from the center of the inside lock activating device through the closest point on the perimeter of the glazing panel, which is within 36 inches (900 mm), and just far enough onto the panel to ensure that the impactor clears the edge of the door and the panel. Pull back the pendulum weight to the height necessary to product the required impact and release it. If the panel is broken, reach through the opening and attempt to open the door by unlocking it from the inside.

Following the door impact test, inspect the door to determine whether there is enough damage in invalidate the subsequent tests; if there is, replace it.

(i) Hinge Impact Test. Prepare the test specimen in accordance with Section 41.1006 using the full-size test fixture and lock the door in a closed position. When testing hinges incorporating a mechanical interlock between the leaves in the closed position and door assemblies using such hinges, re-

move the hinge pin during this test. Set up the door ram pendulum weight so that its axis is horizontal, and perpendicular to the exterior face of the door at a point 8 inches (200 mm) from the bottom hinge on a horizontal line through the midpoint of the hinge.

Attach an impact buffer as described in section 41.1007(h) to the face of the door, centered on the impact point, and position the pendulum so that its striking nose just touches the surface of the buffer when at rest. Pull back the pendulum weight to the height necessary to produce the required impact and release it. Subject the door to two impacts at each required impact level, attaching a new buffer for each impact. After each impact, try to open the door.

A door component failure consists of any splitting or fracture of the door which allows it to be opened; a jamb component failure consists of any splitting, fracture or pullout of the attachment screws which allows the door to be opened; a hinge component failure consists of any damage to the leaves or pin of the hinge which allows the door to be opened.

Following the hinge impact test, inspect the components to determine whether there is sufficient damage to invalidate the subsequent test; if there is, replace those damaged.

(j) Bolt Impact Test. Prepare the test specimen in accordance with Section 41.1006 and lock the door in the closed position. Set up the door ram pendulum weight so that its axis is horizontal, and perpendicular to the face of the door at a point defined by the intersection of a vertical line 8 inches (200 mm) from the lock edge, and a line from the center of the bolt to the center of the mid-height hinge (or the midpoint between hinges when the door is hung with two hinges).

Attach an impact buffer as described in Section 41.1007(h) to the face of the door, centered on the impact point, and position the pendulum so that it just touches the surface of the buffer when at rest. Pull back the pendulum weight to the height necessary to produce the required impact and release it. Subject the door to two impacts at each required impact level, attaching a new buffer for each impact. After each impact, try to open the door or test panel by turning the knob, and test the deadbolt and dead latch for end pressure resistance as in Section 41.1007(e).

Acceptance Criteria

Sec. 41.1008 (a) General. An item shall fail a test if an individual can open the door from the outside by pushing or pulling on it, by turning the knob, by manipulating an exposed lock mechanism, by reaching through damaged portions of the door and unlocking it from the inside; or can enter through damaged portions of the door even though it might not be possible to open the door; or if the dead latch or deadbolt can be depressed by a static load applied by hand after being subjected to the levels of energy set forth in the Uniform Building Code.

A jamb/strike component failure consists of a pullout or fracture of the strike attachment screws or any splitting, bending or fracture of the door jamb at the strike which permits the door to be opened; a door component failure consists of any splitting or fracture of the door which allows it to be opened; a lock component failure consists of any damage to the lock mechanism or bolt which allows the door to be opened after being subjected to the levels of energy set forth in the Uniform Building Code.

(b) Disassembly. Door assemblies and components shall incorporate no screw, bolt, nail, staple or other mechanical fastener which is accessible from the outside and which could be removed by hand or with the aid of manipulation tools as described in Section 41.1004(i) within a period of 5 minutes thus permitting entry by disassembly.

(c) Strike Hole Size. For locks incorporating dead latches, the size of the latch retaining hole in the strike shall be such that it shall not be possible for both the dead latch and dead latch plunger to enter the hole together when the latch is fully extended.

(d) Bolt Pressure Resistance. When locks are tested, the force required to depress the latch or deadbolt from the locked and projected position shall not be less than specified in the Uniform Building Code.

Report

Section 41.1009. The test report shall include:

(a) Name and Address of the facility or laboratory performing these tests and issuing the report as well as the dates of testing and issuance of the report.

(b) Identification of the sample tests (e.g., name of manufacturer, model and/or series number of product and other information as may be pertinent).

(c) Final assembly drawing(s) and components list relative to type, size, location and number of anchors, locking devices and mounting screws used.

(d) Statement indicating that specimen either passed or failed these tests.

(e) Statement that all tests were conducted in accordance with these procedures.

APPENDIX D

Part B—Horizontal Sliding Doors

See Section 4106, State Building Code 2 MCAR § 1.10109.

Scope

Sec. 41.1011. Part B of this Standard covers test methods for sliding door assemblies that are required for building security by the Uniform Building Code.

Test Equipment

Sec. 41.1012. Four tension-loading devices capable of delivering and measuring tensile forces of up to 300 lbf (1340 N) with an accuracy of + 5 percent for each applied load level are required for these tests.

Manipulation tools shall consist of: a knife or spatula with a thin blade approximately 1/32 inch (0.8 mm) thick, not more than 1 inch (25 mm) wide and no longer than 6 inches (150 mm); slotted and phillips type screw drivers not exceeding 10 inches (250 mm) in length; common hand and needle nose pliers not exceeding 8 inches (200 mm) in length; and a piece of stiff steel wire with a diameter of approximately 1/16 inch (1.6 mm) and a length of not in excess of 3 feet (900 mm).

Disassembly

Sec. 41.1013. Door assemblies and components shall incorporate screw, bolt, nail, staple or other mechanical fastener which is accessible from the outside and which could be removed by hand or with the aid of manipulation tools as described in Section 41.1012 within a period of 5 minutes thus permitting entry by disassembly.

Samples for Testing

Sec. 41.1014. Specimens shall be representative, and the construction shall be verified by assembly drawings and bill of materials. Complete manufacturer or fabricator installation instructions and full-size or accurate scale templates for all items and hardware shall be included.

Construction and Size

Sec. 41.1015. The construction and size of the test door assemblies, jambs and headers, and all hardware components shall be representative of that for which acceptance is desired.

The door assembly and mounting in the support fixture shall simulate the rigidity normally provided to a door assembly in a building by the ceiling, floor and walls.

Tests

Sec. 41.1016. Sample doors submitted for testing shall be glazed. Panels shall be closed and locked. Holes may be drilled at convenient locations on the assembly to attach load adapter brackets and the glazing may be taped to prevent possible injury from shattering under load. Loads may be applied from either the interior or exterior side of the door.

Prior to testing, remove from the sliding door assembly all mechanical fasteners which can be removed from the exterior by hand or with the aid of manipulation tools, as described in Section 41.1012, within a period of 5 minutes.

Tests shall be performed in the following order:

Test I. With the panels in the normal position, a concentrated load of 300 pounds (1340 N) shall be applied separately to each vertical stile incorporating a locking device, at a point on the stile within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the door. Remove the load and determine if the locking device can be unlocked by manipulation as described in Test VIII.

Test II. With panels in the normal position, a concentrated load of 300 pounds (1340 N) shall be applied separately to each vertical pull stile incorporating a locking device, at a point on the stile within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the door while, simultaneously, an additional concentrated load of 150 pounds (670 N) is applied to the same area of the same stile in a direction perpendicular to the plane of glass toward the interior side of the building. Remove the load and determine if the locking device can be unlocked by manipulation as described in Test VIII.

Test III. With the panels in the normal position, a concentrated load of 300 pounds (1340 N) shall be applied separately to each vertical pull stile incorporating a locking device, at a point on the stile within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the door while, simultaneously, an additional concentrated load of 150 pounds (670 N) is applied to the same area of the same stile in the direction perpendicular to the plane of the glass toward the exterior side of the door. Remove the load and determine if the locking device can be unlocked by manipulation as described in Test VIII.

Test IV. With the movable panel lifted upward to its full limit within the confines of the door frame (a force of 150 pounds [670 N], plus the weight of the panel, shall be divided equally and applied to the bottom rail within 6 inches (150 mm) of the corners to move panels upward), a concentrated load of 300 pounds (1340 N) shall be applied separately to each vertical pull stile incorporating a locking device, at a point on the stile within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the door. With the loads applied, determine if the locking device can be unlocked by manipulation as described in Test VIII.

Test V. With the movable panel lifted upward to its full limit within the confines of the door frame as described in Test IV, a concentrated load of 300 pounds (1340 N) shall be applied separately to each vertical pull stile incorporating a locking device, at a point on the stile within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the door while, simultaneously, and additional concentrated load of 150 pounds (670 N) is applied to the same area of the same stile in the direction perpendicular to the plane of the glass toward the interior side of the door. With the loads applied, determine if the locking device can be unlocked by manipulation as described in Test VIII.

Test VI. With the movable panel lifted upward to its full limit within the confines of the door panel as described in Test IV, a concentrated load of 300 pounds (1340 N) shall be applied separately to each vertical stile incorporating a locking device, at a point on the stile within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the door while, simultaneously, and additional concentrated load of 150 pounds (670 N) is applied to the same area of the same stile in the direction perpendicular to the plane of the glass toward the exterior side of the door. With the loads applied, determine if the locking device can be unlocked by manipulation as described in Test VIII.

Test VII. For inside sliding doors, repeat Test V while simultaneously applying a concentrated load of 50 pounds (220 N) at the end of the movable bottom rail near the interlock stiles and inward. For outside sliding doors, repeat Test VI while simultaneously applying a concentrated load of 50 pounds (220 N) at the end of the movable bottom rail near the interlock stiles and outward.

Test VIII. Examine the assembly and determine a method and position for inserting a tool through the door assembly from the outside so as to contact the locking device or the latch. Determine whether it is possible to insert or manipulate with any of the manipulation tools described in Section 41.1012 so as to unlock the door. Such assemblies shall resist manipulation for a period of not less than 5 minutes.

Test IX. Repeat Tests I, II and III for fixed panels locating the load point at the midpoint of the stile opposite the meeting stile of the panel under test.

Performance Requirements

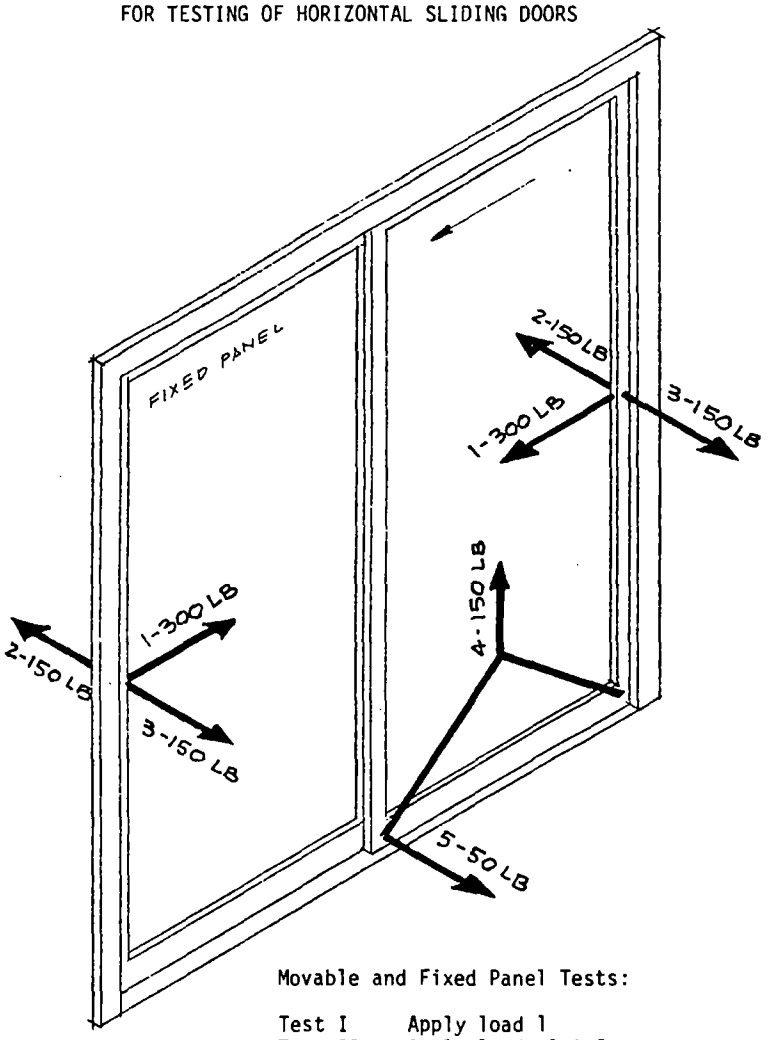
Sec. 41.1017. A sliding door assembly shall fail these tests if at any time during or after the test the sliding door assembly does not remain engaged, intact and in the closed and locked position; or if one can enter by manipulating an exposed component or through displaced or damaged portions.

Report

Sec. 41.1018. See Section 41.1009.

DIRECTIONS AND POINTS OF LOAD APPLICATION

FOR TESTING OF HORIZONTAL SLIDING DOORS



Movable and Fixed Panel Tests:

Test I	Apply load 1
Test II	Apply loads 1 & 2
Test III	Apply loads 1 & 3
Test IV	Apply loads 4 & 1
Test V	Apply loads 4, 1 & 2
Test VI	Apply loads 4, 1 & 3
Test VII	Apply loads 4, 1, 3 & 5
Test VIII	Manipulation Described
Test IX	For fixed panels repeat Tests I, II & III with the load point at the midpoint of the stile opposite the meeting stile of the door panel being tested.

FIGURE 1

APPENDIX "D"

STATE BUILDING CODE 2 MCAR § 1.10109

STATE BUILDING CODE STANDARD 41-2

TESTS FOR SECURITY OF WINDOW ASSEMBLIES

See Section 4107, State Building Code

Scope

Sec. 41.2001. This Standard covers test methods for window assemblies that are required for building security by the Uniform Building Code. For the purpose of this Standard, windows are classified as follows: Type A window assemblies incorporate one or more sashes that open by sliding in the plane of the wall in which the window is installed.

Type B window assemblies incorporate one or more framed sashes which are hinged at or near two corners of the individual sash and open toward the exterior of the wall.

Type C are window assemblies which incorporate one or more sashes which open toward the interior and are hinged at or near two corners of the sash.

Type D are window assemblies which incorporate one or more sashes which are hinged or pivot near the center so that part of the sash opens into the interior wall and part opens toward the exterior.

Definitions

Sec. 41.2002. JAMB—See WINDOW FRAME.

LOCKING DEVICE is a part of a window assembly which is intended to prevent movement of the movable sash, which may be the sash lock or sash operator.

MULLION is a window frame member which meets with and provides structural support to a pair of adjacent sashes at their meeting edges.

MUNTIN is a structural member of a sash which extends either horizontally between the stiles or vertically between the rails to support individual panes of glazing material when the sash incorporates two or more panes.

RAIL is a horizontal member of a sash frame. A meeting rail is one which mates with a rail of another sash or a framing member of the window frame when the sash is in the closed position.

SASH is an assembly of stiles, rails and, sometimes, muntins assembled into a single frame which supports the glazing material. A fixed sash is one which is not intended to be opened. A movable sash is intended to be opened.

SILL is the lowest horizontal member of a window frame.

STILE is a vertical framing member of a sash. A meeting stile is one which mates with a stile of another sash, or a vertical framing member of the window frame when the sash is in the closed position.

WINDOW ASSEMBLY is a unit which includes a window and the anchorage between the window and the wall.

WINDOW FRAME is that part of a window which surrounds and supports the sashes and is attached to the surrounding wall. The members include side jambs (vertical), head jamb (upper, horizontal), sill and mullions.

Test Equipment

Sec. 41.2003. Four tension-loading devices capable of delivering and measuring tensile forces of up to 150 lbf (670 N) with an accuracy of ± 5 percent for each applied load level are required for these tests.

Manipulation tools shall consist of: a knife or spatula with a thin blade approximately 1/32 inch (0.8 mm) thick, not more than 1 inch (25 mm) wide and no longer than 6 inches (150 mm); slotted and phillips type screw drivers not exceeding 10 inches (250 mm) in length; common hand and needle nose pliers not exceeding 8 inches (200 mm) in length; and a piece of stiff steel wire with a diameter of approximately 1/16 inch (1.6 mm) and length of not in excess of 3 feet (900 mm).

Disassembly

Sec. 41.2004. Window assemblies and components shall not include screws, bolts, nails, staples or other mechanical fasteners which are accessible from the exterior and which could be removed by hand or with the aid of manipulation tools as described in Section 41.2003 within a period of 5 minutes thus permitting entry by disassembly.

Samples for Testing

Sec. 41.2005. Specimens shall be representative, and the construction shall be verified by assembly drawings and bill of materials. Complete manufacturer or fabricator installation instructions and full size or accurate scale templates for all items and hardware shall be included.

Sample Preparation

Sec. 41.2006. Following the manufacturer's installation instructions, in-

stall the window assembly in a rigid test fixture which simulates the rigidity normally provided to a window assembly in a building. The unit shall be fully glazed. Holes may be drilled in the sash at convenient locations to attach load adapter brackets and the glazing may be taped to prevent possible injury from shattering under load. Loads may be applied from either the interior or exterior side of the window.

Before performing any test, remove from the window assembly all screws, bolts, hinge pins, rigid snap glazing beads or other mechanical fasteners which can be removed from the exterior by hand or with the aid of manipulation tools as described in Section 41.2003. Sashes shall be closed and locked.

Tests for Sliding Windows

Sec. 41.2007. Tests for Type A window assemblies shall be performed in the following order:

Test I. With each sliding sash in the normal position, a concentrated load of 150 pounds (670 N) shall be applied separately to each sash member incorporating a locking device, at a point on a sash member within 6 inches (150 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the window. Remove the load and apply the manipulation test described in Section 41.2010.

Test II. With each sliding sash in the normal position, a concentrated load of 150 pounds (670 N) shall be applied separately to each sash member incorporating a locking device, at a point on a sash member within 6 inches (160 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the window while, simultaneously, an additional concentrated load of 75 pounds (340 N) is applied in the same area of the same sash member in the direction perpendicular to the plane of the glass toward the interior side of the window. Remove the load and apply the manipulation test described in Section 41.2010.

Test III. With each sliding sash in the normal position, a concentrated load of 150 pounds (670 N) shall be applied separately to each sash member incorporating a locking device, at a point on the sash member within 6 inches (150 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the window while, simultaneously, an additional concentrated load of 75 pounds (340 N) is applied to the same sash member in a direction perpendicular to the plane of the glass toward the exterior side of the window. Remove the load and apply the manipulation test described in Section 41.2010.

Test IV. For horizontal sliding windows, move the sliding sash upward by applying a force of 75 pounds, plus the weight of the sash, divided equally between the lower corners of the sash. For vertical sliding or hung type windows, move the sash toward the side offering the least resistance by applying a force of 75 pounds (340 N) to the side corners opposite the frame member towards which the window is being moved. Simultaneously, apply a

concentrated load of 150 pounds (670 N) to each sash member incorporating a locking device, at a point on the sash within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the window. With the assembly under load, apply the manipulation test described in Section 41.2010.

Test V. With the sliding sash moved upward (for horizontal sliding windows) or to the side (for vertical or hung-type windows) within the confines of the window frame as described in Test IV, a concentrated load of 150 pounds (670 N) shall be applied separately to each sash member incorporating a locking device, at a point on the sash within 6 inches (150 mm) of the locking device, in a direction parallel to the plane of the glass that would tend to open the window while, simultaneously, an additional concentrated load of 75 pounds (340 N) is applied to the same area of the same sash in the direction perpendicular to the plane of the glass toward the interior side of the window. With the assembly under load, apply the manipulation test described in Section 41.2010.

Test VI. With the sliding sash moved upward (for horizontal sliding windows) or to the side (for vertical sliding or hung-type windows) within the confines of the window frame as described in Test IV, a concentrated load of 150 pounds (670 N) shall be applied separately to each sash member incorporating a locking device, at a point on the sash member within 6 inches (150 mm) of the locking device, in the direction parallel to the plane of the glass that would tend to open the window while, simultaneously, an additional concentrated load of 75 pounds (340 N) is applied to the same sash member in the direction perpendicular to the plane of the glass toward the exterior side of the window. With the assembly under load, apply the manipulation test described in Section 41.2010.

Test VII. For inside sliding windows, repeat Test V while simultaneously applying a concentrated load of 25 pounds (110 N) at the end of the movable sash member located opposite the frame member toward which the sash is either moved or lifted and near the corner which is furthest from the locking device; such load shall be applied perpendicular to the sash and toward the interior. For outside sliding windows, repeat Test VI while simultaneously applying a concentrated load of 25 pounds (110 N) located in the same manner as for inside sliding windows, but applied in the opposite direction or toward the exterior.

Test VIII. Repeat Tests I, II and III for fixed sashes, which are part of a Type A window assembly, locating the load point at the midpoint of the stile or rail opposite the meeting stile or rail of the sash under test.

Tests for Hinged Window Assemblies

Sec. 41.2008. Tests for Types B and C window assemblies shall be performed in the following order:

The manipulation test described in Section 41.2010 shall be applied after

Tests I and II while the sash is under load and after Test IV with the loads removed.

Test I. With the swinging sash in the normal position, simultaneously apply a concentrated load of 75 pounds (340 N) within 3 inches (75 mm) of each end of the rail or stile which is opposite the hinged side, in the direction perpendicular to the plane of the glass that would tend to open the window.

Test II. Repeat Test I and simultaneously apply a load of 75 pounds (340 N) on the outside within 1 inch (25 mm) of each end of the stile or rail which is opposite the hinge side, in a direction parallel to the plane of the glazing which would tend to disengage the lock. Remove the loads.

Test III. With the swinging sash in the normal position, apply a concentrated load of 150 pounds (670 N) on the rail or stile containing the locking device within 6 inches (150 mm) of the lock in a direction perpendicular to the plane of the glass that would tend to open the window.

Test IV. Repeat Test III and simultaneously apply a load of 75 pounds (340 N) on the outside within 1 inch (25 mm) of each end of the stile or rail which is opposite the hinge side, in a direction parallel to the plane of the glazing which would tend to disengage the lock.

Tests for Pivoted Window Assemblies

Sec. 41.2009. Tests for Type D window assemblies shall be performed in the following order:

The manipulation test described in Section 41.2010 shall be applied after Tests I and II while the sash is under load and after Test IV with the loads removed.

Sec. 41.2009. Tests for Type D window assemblies shall be performed in the following order:

The manipulation test described in Section 41.2010 shall be applied after Tests I and II while the sash is under load and after Tests III and IV with the loads removed.

Test I. With the sash in the normal position, simultaneously apply a concentrated load of 37.5 pounds (170 N) within 3 inches (75 mm) of both ends of each rail or stile which is perpendicular to the pivot sides in the direction that would tend to open the sash. Remove the loads.

Test II. With the sash in the normal position, apply a concentrated load of 75 pounds (340 N) on a rail or stile containing a pivot within 1 inch (25 mm) of the pivot in a direction parallel to the pivots tending to disengage the pivot under test.

Test III. Repeat Test II, applying the load to the opposite rail or stile. Remove the load.

Test IV. With the sash in the normal position, apply a concentrated load of 150 pounds (670 N) on the rail or stile containing the locking device within 6 inches (75 mm) of the lock in a direction perpendicular to the sash and tending to open the window.

Test V. Repeat Test IV while simultaneously applying the load specified in Test II. Repeat Test IV while simultaneously applying the load specified in Test III above.

Manipulation of Locking Device

Sec. 41.2010. Examine the assembly and determine a method and position of insertion of a tool through the window assembly from the outside so as to contact the locking device. Determine whether it is possible to insert any of the manipulation tools as described in Section 41.2003 and manipulate with them so as to unlock the window. Such window assemblies shall resist manipulation for a period of not less than 5 minutes.

Performance Requirements

Sec. 41.2011. A window assembly shall fail these tests if at any time during or after the tests the assembly does not remain engaged, intact and in the closed and lock position such as to preclude human entry.

Report

Sec. 41.2012. The test report shall include:

(a) Name and address of the facility or laboratory performing these tests and issuing the report as well as the dates of testing and issuance of the report.

(b) Identification of the sample tested (e.g., name of manufacturer, model and/or series number of product and other information as may be pertinent).

(c) Final assembly drawing(s) components list relative to type, size, location and number of anchors, locking devices and mounting screws used.

(d) Statement indicating that specimen either passed or failed these tests.

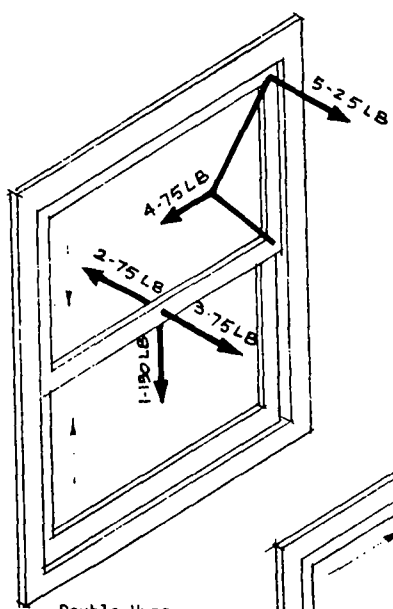
(e) Statement that all tests were conducted in accordance with these procedures.

DIRECTIONS AND POINTS OF LOAD APPLICATION

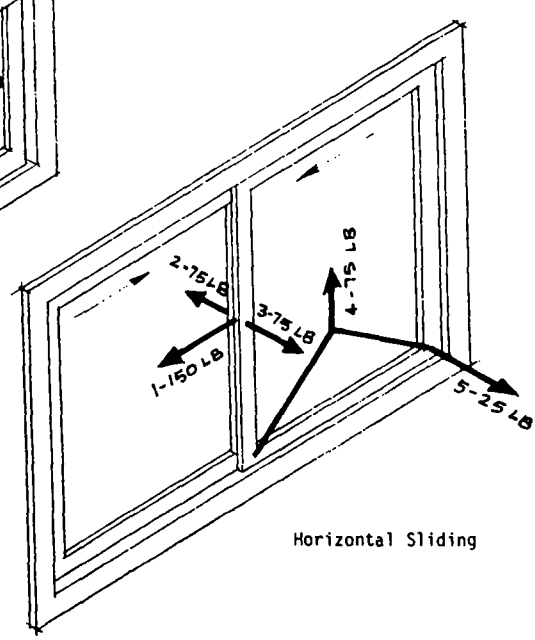
FOR TESTING OF TYPE A WINDOWS

Sliding Sash Tests:

Test I	Apply load 1
Test II	Apply loads 1 & 2
Test III	Apply loads 1 & 3
Test IV	Apply loads 4 & 1
Test V	Apply loads 4, 1 & 2
Test VI	Apply loads 4, 1 & 3
Test VII	Apply loads 4, 1, 3 & 5
Test VIII	For fixed sashes locate the load point at the midpoint of the stile or rail opposite the meeting stile or rail of the sash under the test and apply loads as described in Tests I, II & III.



Double Hung



Horizontal Sliding

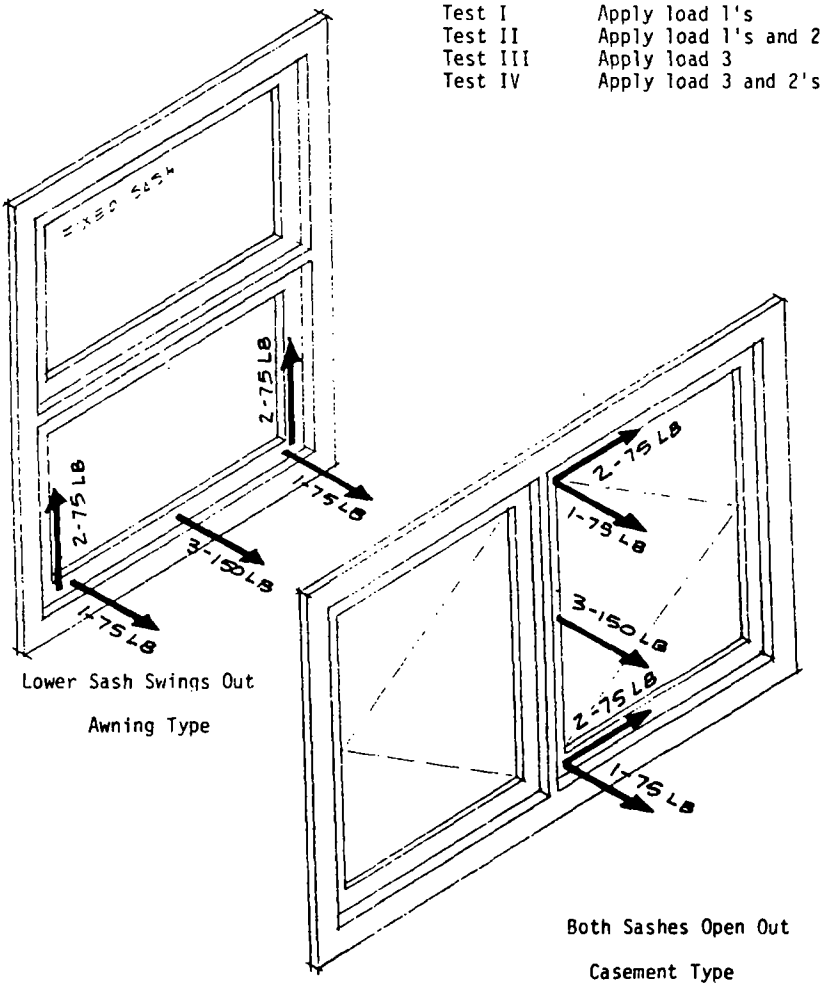
FIGURE 2

DIRECTIONS AND POINTS OF LOAD APPLICATION

FOR TESTING OF TYPES B AND C WINDOWS

Tests for Hinged Sashes:

Test I	Apply load 1's
Test II	Apply load 1's and 2's
Test III	Apply load 3
Test IV	Apply load 3 and 2's



Lower Sash Swings Out

Awning Type

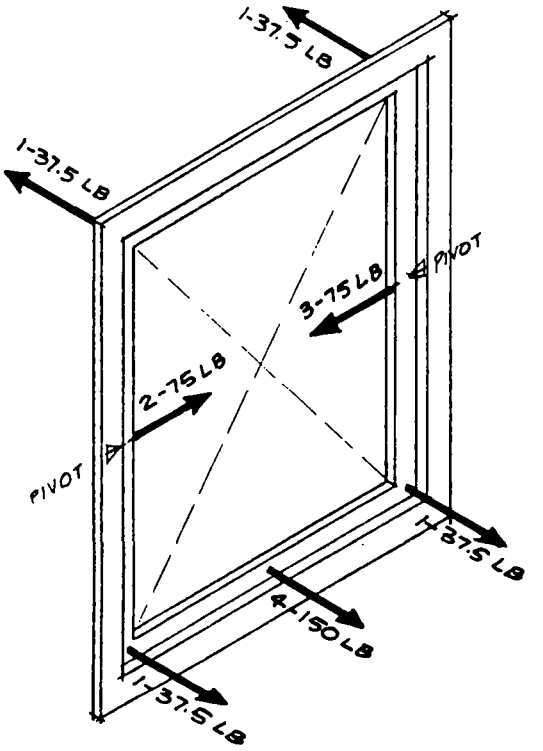
Both Sashes Open Out

Casement Type

FIGURE 3

DIRECTIONS AND POINTS OF LOAD APPLICATION

FOR TESTING OF TYPE D WINDOWS



As shown, pivots are represented as triangles and sash pivots out from the bottom and in at the top.

Pivoting Sash Tests:

Test I	Apply load 1's
Test II	Apply load 2
Test III	Apply load 3
Test IV	Apply load 4
Test V	Apply loads 4 & 2, then remove load 2 and apply loads 4 & 3.

FIGURE 4

MINNESOTA CODE OF AGENCY RULES

RULES OF THE DEPARTMENT OF ADMINISTRATION

1982 Reprint

All rules as in effect on September 15, 1982

Prepared by

THE OFFICE OF REVISOR OF STATUTES
Room 3, State Capitol, St. Paul, Minnesota 55155

Distributed by

STATE REGISTER AND PUBLIC DOCUMENTS DIVISION
DEPARTMENT OF ADMINISTRATION
117 University Avenue, St. Paul, Minnesota 55155

For Table of Contents see Volume 5A.

MINNESOTA HEATING, VENTILATING, AIR CONDITIONING AND REFRIGERATION CODE

SBC 7101 TITLE AND SCOPE. Identification and Title. Chapters 71 through 85 shall be known as the "Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code." Unless otherwise specified, subsequent references in these Chapters to "this Code" shall mean the "Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code."

SBC 7102 Purpose. The Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code is a system of rules, regulations and principles formally applied in the field of heating, ventilating, air conditioning and refrigerating, for which it is written and is established as a minimum standard for safety, health and general welfare of the public. This code is a minimum standard and is not intended nor should it be used or considered a design manual.

SBC 7103 Scope. The provisions of this Code shall apply to the design, erection, installation, construction, alteration, repair, relocation, replacement, addition to, or use of any heating, ventilating, air conditioning, refrigeration or cooling system, equipment or miscellaneous devices whether used in connection with space, comfort, process of industrial heating, ventilating, air conditioning or refrigeration.

Where, in any specific case, different sections of this Code, specify different materials, methods of construction or other requirements, the most restrictive provision shall govern.

The inclusion of specific requirements relative to the manner of installation of any plant or equipment in any one or more parts of said Code shall not limit this procedure to any particular type of installer, nor provide a basis upon which determination of the right to perform such procedures shall be made. The authority for such determination will be found in the various licensing ordinances for each type of installer who performs the work.

SBC 7201 GENERAL REGULATIONS. Construction and Interpretation. The provisions of the Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code are based on minimum standards to safeguard life, health and general welfare and therefore should be construed and interpreted in a manner which is consistent with and will give effect to such purposes.

SBC 7202 New Buildings. All materials or systems or parts thereof shall be installed to meet or exceed the minimum provisions of this code. The provisions of this code shall apply to all buildings and structures in the state, the erection of which is commenced after the date of acceptance of this code.

SBC 7203 Existing Buildings. The provisions of this code shall apply to the design, erection, installation, construction, alteration, repair, relocation, replacement, addition to, or use of any heating, ventilating, air conditioning plant or refrigeration equipment or system commenced after the date of acceptance of this code. Where the administrative authority shall find that the full performance of bringing such work into compliance with all the requirements of this code would result in exceptional or undue hardship by reason of mechanical difficulty or impractibility, a deviation may be granted by the administrative authority only to the extent that the deviation can be granted without impairing the intent or purpose of this code.

SBC 7204 Change in Use. The provisions of this code shall apply to every building or structure or portion thereof which at any date after acceptance of this code is devoted to a new use for which the requirements under this code are in any way more stringent than the requirements governing the previous use.

SBC 7205 Alternate Equipment Appurtenances, Material and Methods. The administrative authority may approve the use of appurtenances, materials and methods of a type not conforming with the requirements of this code after a determination that such appurtenances, material, or method is of such design or quality, or both, as to appear to be safe, suitable, and proper for the use for which it is intended.

SBC 7206 Tests. When there is insufficient evidence to verify claims for alternate materials, the administrative authority may require as proof of suitability a test of compliance by an approved testing laboratory at the expense of the applicant.

Tests shall be made in accordance with generally recognized standards; but in the absence of such standards the administrative authority shall specify the test procedure.

The administrative authority may require tests to be repeated if at any time there is reason to believe that an alternate material no longer conforms to the requirements on which its approval was based.

SBC 7207 Submittal and Approval of Plans. Plans and specifications shall be submitted to the administrative authority as required.

See specific chapters for further detail as to plans and specifications where required.

SBC 7208 Safety Hazard. Where a safety hazard exists on a premise by reason of an existing installation or lack of proper equipment or material thereof, the owner or his agent shall be responsible for making such corrections as may be necessary to abate such hazard and bring the installation within the provisions of this code.

SBC 7209 Boiler and Furnace Equipment Room Size. Boilers and furnaces shall not be installed in confined spaces such as alcoves or closets unless specifically approved for such installation and then only if installed in accordance with the approval. Boilers and furnaces shall be installed in rooms that are large in comparison to the size of the appliance and shall provide proper clearance for accessibility for servicing and maintaining such equipment.

Boiler and furnace rooms in other than one and two family dwellings shall be such that they have an area of at least ten times the area occupied by the boiler and eight times the area occupied by the furnace. If additional appliances or equipment are to be located in the boiler or furnace room, additional area shall be provided equal to area occupied by such equipment plus required clearances.

At least three feet clear space shall be provided in front of all zone valves, controls, etc. for access and servicing.

SBC 7301 LOAD CALCULATIONS — HEATING, COOLING AND VENTILATING. Heat Loss Calculation Required. Before designing a heating system, a heat loss calculation must be made of the maximum probable heat loss of each room or space to be heated, based on maintaining a selected indoor air temperature during periods of design outdoor weather conditions. These heat losses may be divided into groups as follows:

(1) The transmission losses or heat transmitted through the confining walls, floor, ceiling, glass or other surfaces.

(2) The infiltration losses or heat required to warm outdoor air which leaks in through cracks and crevices around doors and windows, or through open doors and windows, or heat required to warm outdoor air used for ventilation.

(3) The design data and calculations for heating loads shall be in accordance with procedure outlined in A.S.H.R.A.E. Fundamentals and Equipment for the latest publication after acceptance of this Code, or Manual J. Load Calculations, National Warm Air Heating and Air Conditioning Association.

SBC 7302 Definitions. The following terms shall mean:

a. THERMAL CONDUCTANCE OF AN AIR SPACE. The time rate of heat flow through a unit area of an air space per unit temperature difference between the boundary surfaces. Its value is expressed in BTU per (hour) (square foot of area) (Fahrenheit degree).

b. BRITISH THERMAL UNIT (BTU). Approximately, it is the heat required to raise the temperature of a pound of water from 59 F. to 60 F.

c. THERMAL CONDUCTANCE. The time rate of heat flow expressed in BTU per (hour) (square foot) (Fahrenheit degree average temperature difference between two surfaces.) The term is applied for the thickness or construction stated **not per inch of thickness.**

f. FILM OR SURFACE CONDUCTANCE. The time rate of heat exchange by radiation, conduction, and convection of a unit area of a surface with the surroundings and the surrounding air or other fluid. Its value is expressed in BTU per (hour) (square foot of surface) (Fahrenheit degree temperature difference). Subscripts i and o are used to denote inside and outside surface conductances, respectively.

K. THERMAL CONDUCTIVITY. The rate of heat flow expressed in BTU per (hour) (square foot) (Fahrenheit degree **per inch of thickness.)**

R. THERMAL RESISTANCE. The reciprocal of heat transfer co-efficient, as expressed by U, C, f or a. Its unit is Fahrenheit degrees per BTU (hour) (square foot). For example, a wall with a U value of 0.25 would have a resistance value of R—1/U-1/0.25-4.0.

TEMPERATURE SWING. An assumed indoor temperature swing of not more than 3 degrees on a design day when the space is conditioned 24 hours per day and the thermostat setting is 75° F.

SPECIFIC HEAT. The ratio of the quantity of heat required to raise the temperature of a given mass of any substance one degree to the quantity

required to raise the temperature of an equal mass of a standard substance (usually water at 59 F.) one degree.

Specific heat of air 0.24 BTU per pound per degree (Standard air).

Specific heat of water 1.0 BTU per pound per degree (59 F.).

STANDARD AIR. Air with a density of 0.075 pounds per cubic foot. This is substantially equivalent to dry air at 70° F. and 29.92 in. Hg. Barometric pressure.

U. OVERALL COEFFICIENT OF HEAT TRANSMISSION (AIR TO AIR). The time rate of heat flow expressed in BTU per (hour) (square foot) (Fahrenheit degree temperature difference between air on the inside.)

SBC 7303 Heat Loss Calculation

1. The following design outdoor weather conditions: temperature, wind direction, and wind velocity, shall be as follows:

a. Outside temperature. Select the design temperature from the following list. Use the city closest in proximity to the location of the installation.

TABLE NO. 1

Albert Lea	—20° F.	Marshall	—23° F.
Alexandria	—26° F.	Minneapolis	—19° F.
Bemidji	—38° F.	St. Paul	—19° F.
Brainerd	—31° F.	Moorhead	—28° F.
Detroit Lakes	—35° F.	Rochester	—23° F.
Duluth	—25° F.	Roseau	—38° F.
Fairmont	—19° F.	St. Cloud	—26° F
Faribault	—23° F.	Thief River Falls	—33° F
Fergus Falls	—28° F.	Virginia	—32° F.
Grand Rapids	—37° F.	Willmar	—25° F.
International Falls	—35° F.	Winona	—19° F.
Mankato	—23° F.	Worthington	—20° F.

b. Wind velocity 15 m.p.h.

c. Wind direction N.W.

2. The indoor air temperature that is to be maintained in room or space during the coldest weather shall be in accordance with Table 2 following.

(a) The indoor air temperature is the dry-bulb temperature at the breathing line, 5 feet above the floor, or at the seating level, 30 inches above the floor at a location where the temperature sensing device is not exposed to a condition of abnormal heat gain or heat loss.

3. Infiltration. The heat losses due to infiltration shall be determined by either one of the following methods:

(a) Select unit values and compute the heat equivalent of the infiltration of cold air taking place around outside doors and windows. These unit values depend on the kind or width of crack, and wind velocity assumed at 15 miles per hour. These units when multiplied by the length of crack gives the volume of outdoor air entering the building in cubic feet per hour.

(b) The amount of air leakage may be estimated by assuming a certain number of air changes per hour for each room, the number of changes assumed being dependent upon the type, use and location of the room as indicated in Table 2 following.

(c) The heat loss due to the air infiltration by either the crack method or air change method can be calculated by the following equation:

$H_s=0.24\ Qxd\ (t_i-t_o)$. (1)

Where

H_s=Heat required to raise temperature of infiltration air, BTU per hour.

0.24=Specific heat of air.

Q=volume of outdoor air entering building, cubic feet per hour.

d=density of air at temperature to, pounds per cubic foot.

t_i=inside air temperature, °F. t_o=outside air temperature, °F.

It is sufficiently accurate to use d=0.075 in which case Equation (1) reduces to

$H_s=0.018\ Q\ (t_i t_o)$. (2)

TABLE NO. 2

WINTER INDOOR DRY-BULB TEMPERATURES

TYPE OF BUILDING	Degree F.
Residences	75
Stores	68-70
Public Buildings	72-74
Warm air Baths — Saunas	120
Steam Baths	110
Factories and Machine Shops	60-65
Foundries and Boiler Shops	50-60
Paint Shops	75-80
Hospitals	
Private rooms and wards	72-74
Private rooms (Surgical)	70-80
Operating Rooms	70-75
Kitchens and Laundries	68-70
Toilets	70-75
Bathrooms	70-80
Hotels	
Bedrooms and bath	75
Dining rooms	72
Kitchens and Laundries	68-70
Ballrooms	65-68
Toilets and Service Rooms	68-70
Theaters	
Seating Space	68-72
Lounge Rooms	68-72
Toilets	70-75
Schools	
Classrooms	72-74
Assembly Rooms	68-72
Gymnasiums	55-65
Toilets and Baths	70-75
Wardrobes and Locker Rooms	70-75
Kitchens	68-70
Dining Room and Lunch Room	65-70
Play Rooms	65-70
Natatoriums	75

TABLE NO. 3

AIR CHANGES TAKING PLACE UNDER AVERAGE CONDITIONS EXCLUSIVE OF AIR PROVIDED VENTILATION

KIND OF ROOM OR BUILDING	NO. OF AIR CHANGES Per Hour
Rooms, 1 side exposed	1
Rooms, 2 sides exposed	1 to 1½
Rooms, 3 sides exposed	2
Rooms, 4 sides exposed	2
Rooms with no windows or outside doors	½ to 3
Entrance Halls	2 to 3
Reception Halls	2
Living Rooms	1 to 2
Dining Rooms	1 to 2
Bath Rooms	2
Drug Stores	2 to 3
Clothing Stores	1
Churches, Factories, Lofts, etc.	½ to 3

4. When positive ventilation using outdoor air is provided by air-heating or an air-conditioning unit, the heat required to warm the outdoor air to room temperature must be provided by the unit.

(a) If mechanical exhaust from the room is provided, an amount equal to the outdoor air drawn in by the unit together with the natural infiltration losses must also be provided for by the unit.

(b) If no mechanical exhaust is used, and the outdoor air supply equals or exceeds the amount of natural infiltration that would occur without ventilation, the natural ventilation may be neglected.

5. The sum of the heat losses due to transmission through the outside walls and glass, as well as through any cold floors, ceilings, or roof, plus the heat equivalent of the cold air entering by infiltration or required to replace mechanical exhaust, represents the total heat loss equivalent for any building.

SBC 7304 Internal Heat Source Credits. A portion of the heat supplied by persons, lights, motors and machinery, may be deducted in the case of theaters, assembly halls, industrial plants and commercial buildings such as stores, office buildings, etc. A credit of 70% of continuous lighting load and 50% of sensible occupancy load may be used.

SBC 7305 Cooling Loads: General

(1) SBC 7304 through SBC 7310 outlines the methods and reference needed to be used for calculation of air conditioning cooling loads for occupancy comfort.

The Code requirements are divided into two parts:

(2) Sections SBC 7305-SBC 7308 deals with the cooling loads for commercial and public buildings.

(a) Deductions from the net heat gain for storage and temperature swing when detailed load calculations are approved by the administrative authority.

(3) Section SBC 7309 through SBC 7310 deals with the load for residential cooling.

(a) as 2(a)

SBC 7306 Cooling Load Calculations; Comercial and Public Buildings. Summer cooling load calculations for comfort application require consideration of the following factors:

(1) Design Conditions:

(a) Indoor conditions

(b) Outdoor conditions

(c) Ventilation rate

(2) Instantaneous Heat Load, Sensible and Latent:

(a) Load from solar radiation, sky radiation, and from outdoor-indoor temperature differential for glass areas and exterior walls and roofs, modified by periodic heat flow or lag factors depending on the type of structure.

(b) Load due to heat gain through interior partitions, ceilings and floors.

(c) Load due to ventilation, either natural or mechanical.

(d) Load due to heat sources within the conditioned space such as people, lights, power equipment and appliances.

(c) Load due to moisture transfer through the permable building materials.

(f) Miscellaneous heat sources.

3. Determination of Air Quantity and Apparatus Dew Point.

TABLE NO. 4—OUTDOOR SUMMER CLIMATIC CONDITIONS
(Minnesota)

	Design Dry Bulb			Design Wet Bulb		
Location	1%	2½%	5%	1%	2½%	5%
Alexandria	90	88	85	76	74	72
Duluth	85	82	79	73	71	69
Int. Falls	86	82	79	72	69	68
Minneapolis	92	89	86	77	75	74
St. Paul	92	89	86	77	75	74
Rochester	90	88	85	77	75	74
St. Cloud	90	88	85	77	75	73

Note: Data compiled from official weather stations where hourly weather observations are made and from other sources. Percentage of design data show the per cent of 4-month period, June through September.

SBC 7307 Design Conditions; Commercial and Public Buildings

(1) Indoor conditions. Indoor design conditions for which summer air conditioning is selected should be chosen at 75° F. dry bulb, with a relative humidity of 50 per cent.

(2) Outdoor design conditions. The outdoor design conditions shall be selected from Table No. 4.

(3) Ventilation Rate. Outdoor air requirements for ventilation of conditioned spaces shall be selected from Table No. 5.

SBC 7308 Instantaneous Heat Load: Commercial and Public Buildings

(1) The total cooling load shall be divided into the two components, sensible and latent heat.

(2) Other factors which have a direct effect on the cooling and must be included are:

(a) Solar radiation.

(b) Periodic heat flow through the walls and roofs.

(c) Effect of shading.

(d) Load from moisture transfer through permeable building materials.

(e) Miscellaneous Heat Loads: This item covers the small heat gains from exposed piping, ducts, work done by circulating fans, and other contingencies.

SBC 7309 Cooling Loads; Residential

(1) The design data and calculation methods for determining residential cooling load shall be in accordance with the procedure outlined in A.S.H.-R.A.E., Fundamentals and Equipment, Chapter 27, pages 487 to 529 inclusive or Manual J, Load Calculation, National Warm Air Heating and Air Conditioning Association.

(2) They shall also conform to the requirements as set forth in Sections SBC 7309 and SBC 7310.

SBC 7310 Cooling Load Calculations; Residential. Residential cooling load calculations for comfort application are based on the following factors:

(1) Design Conditions:

(a) Indoor conditions: Indoor design temperature shall be 75° F. with a relative humidity of 50 percent and a temperature swing of not more than 3° F.

(b) Outdoor conditions: The outdoor design conditions shall be selected from Table 4.

(c) Infiltration:

1. The rate of air infiltration shall be based on ½ air change per hour.

2. Factors for calculating natural infiltration are shown in Table 3. Because of the effect of house configuration they are calculated in BTU per square foot of gross exposed wall area.

TABLE No. 5—OUTDOOR AIR REQUIREMENTS[a]

Application	Smoking	Cfm Per Person[b]		Cfm per Sq.[b] Ft. of Floor
		Recommended	Minimum[c]	Minimum[a]
Apartment				
Average	Some	20	10	—
Deluxe	Some	20	10	—
Banking space	Occasional	10	7½	—
Barber shops	Considerable	15	10	—
Beauty parlors	Occasional	10	7½	—
Brokers' board rooms	Very heavy	50	20	—
Cocktail bars	—	40	25	—
Corridors (supply or exhaust)	—	—	—	0.25
Department stores	None	7½	5	0.05
Directors' rooms	Extreme	50	30	—
Drugs stores[a]	Considerable	10	7½	—
Factories[d,f]	None	10	7½	0.10
Five and Ten Cent stores	None	7½	5	—
Funeral Parlors	None	10	7½	—
Garages[d]	—	—	—	1.0
Hospitals				
Operating rooms[f,g]	None	—	—	2.0
Private rooms	None	30	25	0.33
Wards	None	20	10	—
Hotel Rooms	Heavy	30	25	0.33
Kitchens				
Restaurant	—	—	—	4.0
Residence	—	—	—	2.0
Laboratories[a]	Some	20	15	—
Meeting rooms	Very heavy	50	30	1.25
Offices				
General	Some	15	10	0.25
Private	None	25	15	0.25
Private	Considerable	30	25	0.25
Restaurants				
Cafeteria[a]	Considerable	12	10	—
Dining room[a]	Considerable	15	12	—
Schoolrooms[d]	None	—	—	—
Shop, retail	None	10	7½	—
Theater[d]	None	7½	5	—
Theater	Some	15	10	—
Toilets[d] (exhaust)	—	—	—	2.0

[a]Taken from present-day practice.
[b]This is contaminant-free air.
[c]When minimum is used, take the larger of the two.
[d]See local codes which may govern.
[e]May be governed by exhaust.
[f]May be governed by special sources of contamination or local codes.
[g]All outside air recommended to overcome explosion hazard of anesthetics.
For general applications, a basis of estimating the cfm per person may be taken as:
(1.) People not smoking—5 minimum.
(2.) People smoking—15 minimum.

TABLE NO. 6

SENSIBLE COOLING LOAD DUE TO INFILTRATION AND VENTILATION

Outside Design Temperature, °F.	85	90	95
Infiltration, Btuh per square foot of gross exposed wall area	0.7	1.1	1.5
Mechanical Ventilation Btuh per cfm	11.0	16.0	22.0

(2) Occupancy Load. Heat release per occupant of a residence shall be taken as 300 Btuh of sensible heat.

(3) Appliance Load A value of 1200 Btuh of sensible heat release shall be taken for kitchen appliances.

(4) Total Sensible Heat Gains. The total sensible heat gain of the structure is the sum of the sensible heat gains of all rooms plus occupancy and appliance load.

(5) Latent Load. The latent load of a residence is a part of the total heat gain and is estimated to be 30% of the calculated sensible load.

SBC 7311 Total Cooling Load; Residential

(1) The total cooling load is the sum of the sensible load and the latent load.

(2) The total load shall be calculated as 1.3 times the calculated sensible load.

(3) Whenever the distribution system is located outside of the conditioned space — in attics, crawl spaces, or unconditioned rooms, heat gains, to the ducts or pipes must be included as an equipment load and must be considered in equipment selection.

SBC 7401 CHIMNEYS — GAS VENTS — CONNECTORS — (SMOKE PIPES). General Requirements. Venting Required for Fuel Burning. All appliances including fireplaces and incinerators using solid, liquid or gas fuels shall be vented to the outside unless otherwise approved by the administrative authority.

Chimney or Vent Required. Every fuel burning appliance including fireplaces and incinerators shall be connected with a chimney or vent conforming to the provisions of this chapter.

Venting systems and chimneys other than masonry chimneys shall be tested and listed by a nationally recognized testing laboratory such as Underwriters Laboratories Inc. and shall be installed in full compliance with their listing and the manufacturer's instructions and approved for such use by the administrative authority.

A Fuel Fired Appliance shall not be connected to a chimney or vent until the installer has determined that the chimney or vent is properly sized to remove all of the products of combustion safely to the outside air. This requirement shall be deemed to have been fulfilled if the height, area, and configuration are in accordance with the specifications provided by the appliance, chimney or vent manufacturer's engineered specifications.

For general data on the construction of masonry chimneys, vents, fireplaces, and barbecues, reference should be made to the Minnesota State Building Code.

SBC 7402 Definitions. The following terms shall mean:

Chimneys. A vertical shaft enclosing one or more passageways for the removal of combustion products.

Chimney Liner — Non Metallic. A lining material of fire clay or other approved material that meets the requirements of the Minnesota State Building Code.

Chimney Liner — Metallic. A vent pipe or chimney liner inserted within a chimney for the purpose of minimizing condensation of flue products and preventing such condensation from contact with the interior of the type A flue or vent in which it is inserted.

Chimney or Vent. A conduit or passageway, vertical or nearly so for conveying flue gasses to the outer air.

Vent Connector. The pipe connecting an appliance with the chimney, vent or chimney liner. This corresponds to the smoke pipe used with solid or liquid fuels.

Draft Hood. A device built into an appliance or made a part of the vent connector from an appliance, which is designed to (1) insure the ready escape of the products of combustion in the event of no draft, back draft, or stoppage beyond the draft hood; (2) prevent a back draft from entering the appliance; and (3) neutralize the effect of stack action of the chimney or vent upon the operation of the appliance.

Barometric Draft Regulator. A device with functions to maintain a desired draft in an appliance by automatically reducing the chimney draft to the desired value.

Type B. Gas Vents. Vent piping of noncombustible, corrosion resistant material of sufficient thickness, cross-sectional area, and heat insulating quality to avoid excess temperature on adjacent combustible material and certified by nationally recognized testing agency.

Type B.W. Gas Vents. Gas vents listed by a nationally recognized testing agency for venting listed or approved gas fired vented recessed heaters or furnaces. Vents are similar to Type B vents, but may be placed closer to combustible materials due to the special manner in which they are required to be installed.

Type L. Venting Systems. A venting system composed of listed factory built components assembled in accordance with the items of the listing for venting appliances listed for use with Type L Venting Systems. They may be used where Type B Gas Vents are permitted.

SBC 7403 Chimneys. Three general types of chimneys are:

(a) Masonry Chimneys. Field constructed chimneys built in accordance with the requirements of the Minnesota State Building Code.

(b) Factory Built Chimneys. Chimneys that are factory made, listed by a nationally recognized testing agency, for venting gas appliances, gas incinerators, and solid or liquid fuel burning appliances.

(c) Metal Chimneys. (Smoke Stacks) chimneys made of metal of adequate thickness, galvanized or painted, unless suitably corrosion resistant, properly welded or riveted and built in accordance with nationally recognized standards.

Chimneys shall be used for venting the following:

1. All appliances which may be converted readily to the use of solid or liquid fuels.

2. All boilers and warm air furnaces except where approved for connection to type B gas vents approved by the administrative authority.

3. All incinerators.

Termination of Chimneys.

1. Chimneys shall extend at least 3 feet above the highest point where they pass through the roof of a building and at least 2 feet higher than any portion of any building within 10 feet.

2. Chimneys or vents serving gas fired appliances shall extend at least five feet (5') above the highest connected appliance draft hood outlet or flue collar with natural draft.

Size of Chimneys

1. The effective area of the chimney when connected to a single appliance shall be not less than the area of the appliance draft hood outlet or in accordance with approved engineering methods. Ref.: Minnesota State Building Code.

2. The effective area of the chimney when connected to more than one gas appliance shall be not less than the area of the largest vent connector plus 50% of the areas of additional vent connectors or in accordance with approved engineering methods. Ref.: Minnesota State Building Code.

3. When an incinerator is vented by a chimney serving other fuel burning appliances the area of the vent of the incinerator need not be included in calculating the chimney size provided the chimney size is at least one inch larger in equivalent diameter than the diameter of the incinerator vent. No other fuel burning appliance shall be vented into a chimney having a flue fed incinerator or garbage drops.

Inspection of Chimneys

1. All masonry chimneys to which heating boilers or furnaces are to be connected shall be subject to and most successfully withstand a smoke test before such connection is permitted. In the case of new chimneys, the test shall be made after the mortar has set. Such smoke tests shall be made by building a smudge fire at the bottom of the flue, using tar paper or similar material to create the smudge, and when the smoke is flowing freely from the top of the flue, closing it tightly at the top, all heater or vent openings into said flue be tightly closed before test is started and the cleanout openings to be left open for draft. All leaks in such chimney disclosed by such test shall be closed and made tight before the chimney is accepted or a heating plant connected thereto. The contractor shall make or have made such tests.

2. Not more than one flue in same chimney shall be tested at one time.

3. All chimneys in buildings that have been moved to new locations shall be tested in the above manner before being put into use.

4. All chimneys shall have cleanouts and the cleanouts shall be constructed so that they will remain tightly closed when not in use. The fittings used as cleanouts shall have tight-fitting caps to prevent entrance of air into the chimney at those points.

5. When inspection reveals that an existing chimney is not safe for the intended application, it shall be rebuilt to conform to nationally recognized standards, relined with a suitable liner or replaced with a gas vent or chimney suitable for the appliances to be attached.

Chimney Liners — Metallic. Masonry chimneys serving gas fired boilers, furnaces, or other heating devices, whether of the gas designed type or fired by gas conversion burners having an input not exceeding 400,000 BTU per hour, shall be lined continuously from the thimble to the top of the chimney with an approved non-combustible, acid and corrosion resisting liner of the same equivalent cross sectional area as the vent connector.

1. A condensation pocket shall be provided at the base of said liner with provision for a drip, so arranged that excessive condensation of combustion products may be disposed of without damage to the chimney, foundation, floor or footings.

2. The following materials of thickness specified are approved for use as chimney liners.

(a) Aluminum 2S-H14, ½ hard, thickness .032 inches to 8 inches diameter. Temperatures not to exceed 550° F. at outlet of equipment.

(b) Stainless Steel No. 302, No. 26 U.S. Standard gauge to 8 inches diameter, No. 24 U.S. Standard gauge over 8 inches diameter.

(c) Vitreous coated steel of No. 22 U.S. Standard gauge before coating.

(d) Class B vents approved by Underwriters Laboratories. Temperatures not to exceed 550° F. at outlet of appliance.

(e) Other types of liners shall require the approval of the administrative authority.

3. Chimney caps may be used on chimney liners providing they do not obstruct or impair the free emission of the products of combustion, and are approved by the administrative authority.

4. A chimney liner release will be granted only when the administrative authority finds it impossible to install a liner.

5. Outside horizontal masonry flues shall not be used for venting of gas burning appliances.

6. When a gas fired incinerator meeting the smokeless and odorless requirements of ANSI Z21.6-1969 and approved by the Minnesota Pollution Control Agency is properly connected to a masonry chimney, having a tile flue liner, the chimney liner—metallic required above may be omitted. If an incinerator is connected to a chimney as described above having an existing metallic liner for temperatures not to exceed 550°F the liner shall be removed and no liner will be required.

Metal Chimneys (smoke stacks).

1. Installation.

(a) Single-wall metal pipe shall be constructed of sheet steel not less than No. 20 sheet gage or other approved noncombustible corrosion resistant material.

(b) Single-wall metal pipe used to vent gas appliances shall comply with the installation provisions of SBC 1303 (Size of Single-wall Metal Pipe) (a) and (b) following:

(c) Single-wall metal pipe shall be used only for runs directly from the space in which the appliance is located through the roof or exterior wall to the outer air.

(d) Single-wall metal pipe shall not originate in any unoccupied attic or concealed space, and shall not pass through any attic, inside wall, concealed space or through any floor.

(e) When a single-wall metal pipe passes through an exterior wall constructed of combustible material, it shall be guarded at the point of passage by a method described in SBC 7409.

(f) When a single-wall metal pipe passes through a roof constructed of combustible material, it shall be guarded at the point of passage by a method described in SBC 7409 or by a noncombustible, nonventilating thimble not less than 4 inches larger in diameter than the vent pipe and extending not less than 18 inches above and 6 inches below the roof with the annular space open at the bottom and closed only at the top.

2. Installation with Incinerators. Single-wall pipe not less than No. 10 galvanized sheet gage or other equivalent noncombustible, corrosion resistant material may be used for venting incinerators installed in locations such as open sheds, breezeways, or carports, provided the metal pipe is exposed and readily examinable for its full length.

Clearance. Minimum clearances from a single-wall metal pipe to combustible material shall be in accordance with Table of Clearances following:

TABLE OF CLEARANCES

VENT CONNECTOR CLEARANCES REQUIRED FOR GAS APPLIANCES

Appliance	Maximum Distance from Combustible Material: Listed Type B Gas Vent Material	Maximum Distance from Combustible Material: Vent Connectors of Other than Type B Material
Listed Boiler	As listed	6 inches
Listed Warm Air Furnace...	As listed	6 inches
Listed Water Heater.....	As listed	6 inches
Listed Room Heater.....	As listed	6 inches
Listed Floor Furnace.....	As listed	6 inches
Listed Incinerator	Not Permitted	18 inches
Listed Conversion burner (with draft hood).....	6 inches	9 inches
Unlisted Appliances having draft hoods	6 inches	9 inches
Unlisted Appliances without draft hoods	Not Permitted	18 inches

SBC 7404 Gas Vents and Flues, Types and Use. All gas appliances required to be vented except sealed combustion system appliances shall be connected to a venting system that shall be:

(a) Engineered and constructed so as to develop a positive flow adequate to remove flue gasses to the outside atmosphere.

(b) When venting systems serve appliances requiring draft for proper operation they shall be designed and installed to develop adequate draft so as to satisfy the draft requirements of the appliance with the manufacturer's instructions.

Type B Gas Vents.

(a) Application: Not to be used with recessed heaters, incinerators, and appliances listed for use with chimneys only.

(b) Shall be round in physical shape except as approved for B-W vents in the following.

(c) Shall be installed in accordance with this chapter and the manufacturer's specifications.

Type B-W. Gas Vents.

1. The venting of recessed or surface mounted wall heaters or furnaces shall be such that a section of Type B-W vent material shall extend through the plate directly above the heater. Immediately above the highest plate there shall be a transition fitting from the oval class B-W vent to round Class B vent material. This shall extend a minimum of total height of 12 feet (12') above the floor on which the heater sits.

2. Wall heaters or furnaces which have been designed by their manufacturer for a horizontal vent take off and have been so tested and approved shall have their horizontal vent connector as short as possible. The maximum length of the horizontal run shall be 6 feet.

Single Wall Vent Pipe. The material and installation of single wall vents shall comply with the requirements as specified in SBC 7409.

Gas Vent — Termination. Gas vents may be terminated not less than twelve inches (12") above the highest point where they pass through a roof.

1. Each gas vent shall extend above the roof surface and through its flashing. The outlet opening of any vent shall be not less than twelve inches (12") from any portion of the building or structure, nor less than four feet (4') from any of that portion of the building or structure which extends at an angle of more than 45 degrees upward from the horizontal. (See Figure 6 at the end of this Chapter.)

2. Vent caps shall be as specified in SBC 7403.

Type B gas vents shall not terminate less than five feet in vertical height above the highest connected appliance draft hood outlet or flue collar.

Type B-W gas vents serving a vented wall furnace shall not terminate less than twelve feet (12') in vertical height above the bottom of the heater.

Size of Gas Vents. The size of the common vent serving connected gas appliances shall be computed on the basis of an installation 75,000 BTU in excess of the rated input capacity of the installation being made. In no case shall the common vent be smaller than the largest connected draft hood outlet. (See Tables 1, 2, 4 and 5 at the end of this Chapter which set forth minimum acceptable standards.)

(a) In commercial and industrial buildings, the effective area of a Type B gas vent when connected to a single appliance shall not be less than the area of the appliance draft hood outlet or in accordance with approved engineering methods.

Support of Gas Vents. All portions of gas vents shall be adequately supported for the design and weight of the materials employed. Listed gas vents shall be supported and spaced in accordance with their listings and the manufacturer's instructions.

Gas Vents Serving Two or More Gas Appliances Having Draft Hoods.

(a) When two or more vent connectors enter a common vertical gas vent, the smaller connector should enter at the highest level consistent with available headroom or clearance to combustible material and the appliance located as close to vertical vent as possible.

(b) Two or more gas appliances may be vented through a common vent connector or manifold located at the highest level consistent with available (normal) headroom or clearance to combustible material.

(c) The manifold, all junction fittings, and the common vent connector shall be of a size adequate for the combined volume of the vent gases.

Size of Single-wall Metal Pipe.

(a) The effective area of single-wall metal pipe when connected to a single appliance shall be not less than the area of the appliance draft hood

outlet or in accordance with approved engineering methods. (See Table 2 at the end of this Chapter which sets forth minimum acceptable standards.)

(b) The effective area of a single-wall metal pipe when connected to more than one appliance shall be not less than the area of the largest vent connector plus 50% of the areas of additional vent connectors or in accordance with approved engineering methods. (See Table 5 at the end of this Chapter which sets forth minimum acceptable standards.)

Support of Single-wall Metal Pipe. All portions of single-wall metal pipe shall be adequately supported for the design and weight of the material employed.

SBC 7405 Outside Gas Vents and Chimneys. Materials. Outside gas vents and chimneys are not recommended for use in cold climates. When they must be used in these climates, the material shall possess high insulation qualities or be adequately insulated.

SBC 7406 Condensate Drain. When local experience indicates that condensate may be a problem, provisions shall be made to drain off the condensate.

Prohibited Termination. Natural draft vents extending through outside walls shall not terminate adjacent to outside walls or below eaves or parapets.

SBC 7407 Vent Connectors. When Required. Vent connectors shall be used to connect gas appliances to the gas vent, chimney or single-wall metal pipe except when the gas vent, chimney or single-wall metal pipe is directly connected to the appliance.

Materials.

(a) Vent connectors used for conversion burners without draft hoods, incinerators, and unlisted appliances without draft hoods shall be constructed of materials having a resistance to corrosion and heat not less than that of No. 24 galvanized sheet gage.

(b) Vent connectors used for gas appliances having draft hoods and for listed conversion burners having draft hoods shall be constructed of materials having a resistance to corrosion and heat not less than that of No. 26 galvanized sheet gage, except that Type B vent material may be used as the connector between the draft hood and the chimney.

Size of Vent Connector.

(a) The effective area of the vent connector, when connected to an appliance having a single draft hood, shall be not less than the area of the draft hood outlet or shall be in accordance with approved engineering methods. (See Tables 1, 2 and 3 at the end of this Chapter which set forth minimum acceptable standards.)

(b) For single appliances having more than one draft hood outlet, the instructions of the appliance manufacturer shall be followed. If there are none, the effective area of the vent connector shall equal the combined areas of the draft hood outlets for which it acts as a common connector to the venting system.

(c) When two or more appliances are connected to a common vent or chimney, the effective area of each vent, connector shall be not less than

the area of the appliance draft hood outlet or shall be in accordance with approved engineering methods. (See Tables 4, 5, and 6 at the end of this Chapter which set forth minimum acceptable standards.)

(d) Each vent connector of a multiple venting system shall have the greatest possible vertical rise consistent with the headroom available between the draft hood outlet and the point of interconnection to a manifold, to a common vent, or to a chimney, or the vertical rise shall be in accordance with approved engineering methods. (See Tables 4, 5, and 6 at the end of this Chapter which set forth minimum acceptable standards.)

(e) When the size of a connector is increased to overcome installation limitations and obtain connector capacity equal to the appliance input, the size increase shall be made at the appliance draft hood outlet.

(f) Two or more gas appliances may be vented through a common flue or vent connector when necessary, if joined by "Y" fittings as close as practicable to the flue or vent and provided the size of the common flue or vent is sufficient to accommodate the total volume of flue gases. "Y" fittings shall be made so that the angle at which the vent connectors intersect is as small as possible and should not exceed 45°.

Clearance. Minimum clearance from vent connectors to combustible material shall be in accordance with Table of Clearances in SBC 7403. When vent connectors must pass through walls or partitions of combustible material, a thimble shall be used and installed in accordance with one of the methods outlined in the following.

Avoid Unnecessary Bends. The vent connectors shall be installed so as to avoid excessive turns or other construction features which create unnecessary resistance to flow of vent gases.

Joints. Vent connectors shall be firmly attached to draft hood outlets by sheet-metal screws or other approved means.

(a) Vent connectors using listed Type B gas vent material shall be securely assembled using the method shown in the listing and the manufacturer's instructions.

(b) Joints of other than listed Type B gas vent material shall be securely fastened by sheet-metal screws or other approved methods.

Pitch. Vent connectors shall be installed without any downward pitch from the appliance and without any dips or sags.

(a) Vent connectors attached directly to the side outlet draft hoods, such as on floor furnaces, shall be pitched upward from the appliance at least ¼" per foot.

(b) Vent connectors attached to top outlet draft hoods by means of a 90 degree elbow may be horizontal or pitched upward from the appliance.

Length. The horizontal run of the vent connector shall be as short and direct as possible and the appliance shall be located as near the gas vent, chimney, or single-wall metal pipe as practicable. The maximum length of an uninsulated horizontal run of vent connector shall not exceed 75% of the height of the gas vent, chimney, or single-wall metal pipe or shall be in accordance with approved engineering methods.

Support. Vent connectors shall be adequately supported for the design and weight of the materials employed to maintain proper clearance, to prevent physical damage and to prevent separation of the joints.

Location. When the vent connector used for an appliance having a draft hood must be located in or pass through a crawl space or other area difficult of access which may be cold, that portion of the vent connector shall be listed Type B gas vent material or material having equivalent insulation qualities. Single-wall metal pipe used as a vent connector shall not pass through any floor or ceiling.

Chimney Connection. In entering a passageway in a masonry or metal chimney, the vent connector shall be installed above the extreme bottom to avoid stoppage. Means shall be employed which will prevent the vent connector from entering so far as to restrict the space between its end and the opposite wall of the chimney. A thimble or slip joint may be used to facilitate removal of the vent connector. The vent connector shall be firmly attached to or inserted into the thimble or slip joint to prevent it from falling out.

Fireplace. A vent connector shall not be connected to a chimney serving a fireplace unless the fireplace opening is permanently sealed.

SBC 7408 Special Venting Arrangements

Appliance with Sealed Combustion Systems.

(a) The provisions of draft hoods do not apply to listed appliances having sealed combustion systems constructed and installed so that all air for combustion is derived from the outside atmosphere and flue gases are discharged to the outside atmosphere. Such appliances, having integral venting, shall be considered as being properly vented when they are installed in accordance with their listing and the manufacturer's instructions.

(b) Vent terminals of sealed combustion system appliances shall be located not less than nine inches (9") from any opening through which combustion products could enter the building. A sealed combustion system appliance may be installed in a building opening, such as a window. The bottom of the vent terminal and the air intake shall be located at least twelve inches (12") above grade.

Mechanical Draft Systems.

(a) Venting system exhausters may be used in lieu of natural draft vents for any gas appliance except incinerators. When exhausters are used with gas appliances, requiring venting, provisions shall be made to prevent the flow of gas to the main burner in the event of failure of the exhaust system. The interlock shall prove actual air flow.

(b) Vent connectors serving gas appliances vented by natural draft shall not be connected into the discharge side of the power exhausters.

(c) The exit terminals of exhauster equipped gas venting systems shall be located not less than nine inches (9") from any building opening nor less than two feet (2') from an adjacent building and not less than seven feet above grade when located adjacent to public walkways.

(d) Forced draft systems and all portions of induced draft systems under positive pressure during operation shall be designed and installed so as to be gas tight or as to prevent leakage of combustion products in a building.

Ventilating Hoods and Exhaust Systems.

(a) Ventilating hoods and exhaust systems may be used to vent gas burning appliances installed in commercial applications, when approved by the administrative authority.

Dampers. Manually operated dampers shall not be placed in the vent connectors from gas appliances except that manually operated dampers may be installed in the vent connector of listed gas incinerators when recommended by the manufacturer. Such a damper or draft regulator shall be installed in accordance with the instructions accompanying the incinerator. Fixed baffles, such as baffles ahead of draft hoods, are not classified as dampers.

Use of Thimbles.

(a) When passing through combustible walls or partitions vent connectors built of listed Type B gas vent material shall be installed so that the clearances required by the listing are maintained.

(b) Vent connectors made of single-wall metal pipe shall not pass through any combustible walls unless they are guarded at the point of passage by ventilated metal thimbles not smaller than the following:

1. For listed appliances, except incinerators four inches larger in diameter than the vent connector unless there is a run of not less than 6 feet of vent connector in the open, between the draft hood outlet and the thimble, in which case the thimble may be two inches larger in diameter than the vent connector.

2. For unlisted appliances having draft hoods, 6 inches larger in diameter than the vent connector.

3. For incinerators and unlisted appliances without draft hoods, 12 inches larger in diameter than the vent connector.

(c) In lieu of thimble protection, all combustible materials in the wall shall be cut away from the vent connector a sufficient distance to provide the clearance required from such vent connector to combustible material. Any material used to close up such opening shall be noncombustible.

(b) When automatically operated appliances, such as water heaters are vented through natural draft ventilating hoods, dampers shall not be installed in the ventilating system. When the ventilating hood or exhaust system is equipped with power means of exhaust, the appliance control system shall be interlocked so as to permit appliance operation only when the power means of exhaust is in operation.

Appliances with Integral Vents.

(a) Appliances incorporating integral venting means shall be considered properly vented when installed in accordance with their listings and the manufacturer's instructions.

(b) Vent terminals of appliances using natural draft venting shall be located not less than 9 inches from any opening through which combustion products could enter the building. Vent terminals of appliances using forced draft venting shall be located not less than 12 inches from any opening through which combustion products could enter the building.

SBC 7409 Chimney Connectors (Smoke Pipes) for Liquid and Solid Fuels

Smoke Pipe Installation.

(a) Each connector or breeching shall be provided with a proper damper conveniently located.

(b) Each connector or breeching shall be welded, lock seamed or riveted, with all joints lapped not less than 1½ inches and be rigidly secured; and shall have a proper thimble for making a tight connection to the chimney flue. To facilitate installation a flange connection or a draw band connection can be used.

(c) Connectors or breechings shall be supported by means of strap hangers spaced not less than 6 feet on centers. Wire hangers will not be permitted.

(d) Each such connector or breeching shall be as short and direct to the chimney flue as possible and shall be installed with a pitch upward of not less than ¼ inch per running foot.

(e) Singlewall metal pipe connectors shall not pass through any floor or be nearer than twelve inches (12") to any wood or other combustible portion of the building, except as noted below and all combustible materials within eighteen inches (18") shall be covered with a metal or asbestos shield extending at least one foot on each side of the connector pipe and in case of a greater diameter than twelve inches (12") and of less area than six square feet (6 sq. ft.) shall be kept at least sixteen inches (16") away from any woodwork, and such woodwork shall be protected as before specified for the smaller smoke pipes, a distance of three feet (3') on each side of such smoke pipes.

(f) Where single wall metal pipes of twelve (12") or less in diameter pass through a wood or plastered stud partition, they shall be surrounded either by a body of brick, hollow tile, or other incombustible fireproof material of a thickness of at least four inches (4"), around such smoke pipes, or they shall be surrounded by a sheet metal thimble of two concentric rings at least two inches (2") apart, and the entire thimble so constructed that there will be a free circulation of air between the two rings forming the same. Single wall metal pipes of a diameter of six inches (6") or less may have thimbles with one inch (1") air space.

Single Wall Metal Pipe Connections.

(a) Chimneys shall not have connections in more than one story of a building, unless provision is made for effectively closing the openings with devices made of noncombustible materials whenever their use is discontinued temporarily and completely closing them with masonry when discontinued permanently.

(b) Two or more chimney connections shall not be joined for a single connection unless the common connector and chimney are of sufficient size to serve all the appliances thus connected.

(c) The connector pipe serving a heating appliance shall not be connected into the chimney flue serving an incinerator which has the rubbish chute common with the chimney flue.

Connector Pipes, Weight of Metal.

(a) For each steam or hot water boiler or warm air furnace installed under the provision of this Code. the area of the breeching or smoke pipe shall not

TABLE 1—CAPACITY OF TYPE B DOUBLE WALL VENTS SERVING A SINGLE APPLIANCE

Height H	Lateral L	Vent Diameter—D													
		3"	4"	5"	6"	7"	8"	10"	12"	14"	16"	18"	20"	22"	24"
		Maximum Appliance Input-Rating in Thousands of Btu per Hour													
6'	0	46	86	141	205	285	370	570	850	1170	1530	1960	2430	2950	3520
	2'	36	67	105	157	217	285	455	650	890	1170	1480	1850	2220	2670
	6'	32	61	100	149	205	273	435	630	870	1150	1470	1820	2210	2650
	12'	28	55	91	137	190	255	406	610	840	1110	1430	1795	2180	2600
8'	0	50	94	155	235	320	415	660	970	1320	1740	2220	2750	3360	4010
	2'	40	75	120	180	247	322	515	745	1020	1340	1700	2110	2560	3050
	8'	35	66	109	165	227	303	490	720	1000	1320	1670	2070	2530	3030
	16'	23	58	96	148	206	281	458	685	950	1260	1600	2035	2470	2960
10'	0	53	100	166	255	345	450	720	1060	1450	1925	2450	3050	3710	4450
	2'	42	81	129	195	273	355	560	850	1130	1480	1890	2340	2840	3390
	10'	36	70	115	175	245	330	525	795	1080	1430	1840	2280	2780	3340
	20'	NR	60	100	154	217	300	486	735	1030	1360	1780	2230	2720	3250
15'	0	58	112	187	285	390	525	840	1240	1720	2270	2900	3620	4410	5300
	2'	48	93	150	225	316	414	675	985	1350	1770	2260	2800	3410	4080
	15'	37	76	128	198	275	373	610	905	1250	1675	2150	2700	3300	3980
	30'	NR	60	107	169	243	328	553	845	1180	1550	2050	2620	3210	3840
20'	0	61	119	202	307	430	575	930	1350	1900	2520	3250	4060	4980	6000
	2'	51	100	166	249	346	470	755	1100	1520	2000	2570	3200	3910	4700
	10'	44	89	150	228	321	443	710	1045	1460	1940	2500	3130	3830	4600
	20'	35	78	134	206	295	410	665	990	1390	1880	2430	3050	3760	4550
	30'	NR	68	120	186	273	380	626	945	1270	1700	2330	2980	3650	4390
30'	0	64	128	220	336	475	650	1060	1550	2170	2920	3770	4750	5850	7060
	2'	56	112	185	280	394	535	865	1310	1800	2380	3050	3810	4650	5600
	20'	NR	90	154	237	343	473	784	1185	1650	2200	2870	3650	4480	5310
	40'	NR	NR	NR	200	298	415	705	1075	1520	2060	2700	3480	4270	5140
40'	0'	66	132	228	353	500	685	1140	1730	2400	3230	4180	5270	6500	7860
	2'	59	118	198	298	420	579	960	1420	2000	2660	3420	4300	5260	6320
	20'	NR	96	167	261	377	516	860	1310	1830	2460	3200	4050	5000	6070
	40'	NR	NR	NR	223	333	460	785	1205	1710	2310	3020	3840	4780	5820

Table No. 1

SBC 7104

TABLE 1—CAPACITY OF TYPE B DOUBLE WALL VENTS SERVING A SINGLE APPLIANCE—Continued

Height H	Lateral L	Vent Diameter—D 3″	4″	5″	6″	7″	8″	10″	12″	14″	16″	18″	20″	22″	24″
		Maximum Appliance Input-Rating in Thousands of Btu per Hour													
60′	0	NR	136	236	373	535	730	1250	1920	2700	3650	4740	6000	7380	9000
	2′	NR	125	213	330	470	650	1060	1605	2250	3020	3920	4960	6130	7400
	30′	NR	NR	170	275	397	555	930	1440	2050	2780	3640	4700	5730	7000
	60′	NR	NR	NR	NR	334	475	830	1285	1870	2560	3380	4330	5420	6600
80′	0	NR	NR	239	384	550	755	1290	2020	2880	3900	5100	6450	8000	9750
	2′	NR	NR	217	350	495	683	1145	1740	2460	3320	4310	5450	6740	8200
	40′	NR	NR	NR	275	404	570	980	1515	2180	2980	3920	5000	6270	7650
	80′	NR	NR	NR	NR	NR	NR	850	1420	2000	2750	3640	4680	5850	7200
100′	0	NR	NR	NR	400	560	770	1310	2050	2950	4050	5300	6700	8600	10300
	2′	NR	NR	NR	375	510	700	1170	1820	2550	3500	4600	5800	7200	8800
	50′	NR	NR	NR	NR	405	575	1000	1550	2250	3100	4050	5300	6600	8100
	100′	NR	NR	NR	NR	NR	NR	870	1430	2050	2850	3750	4900	6100	7500

See figure 1 and notes for single appliance vents.

TABLE NO. 2—CAPACITY OF SINGLE-WALL METAL PIPE OR TYPE B ASBESTOS CEMENT VENTS SERVING A SINGLE APPLIANCE

Height H	Lateral L	Vent Diameter—D 3″	4″	5″	6″	7″	8″	10″	12″
		Maximum Appliance Input Rating in Thousands of Btu per Hour							
6′	0	39	70	116	170	232	312	500	750
	2′	31	55	94	141	194	260	415	620
	5′	28	51	88	128	177	242	390	600
8′	0	42	76	126	185	252	340	542	815
	2′	32	61	102	154	210	284	451	680
	5′	29	56	95	141	194	264	430	648
	10′	24*	49	86	131	180	250	406	625
10′	0	45	84	138	202	279	372	606	912
	2′	35	67	111	168	233	311	505	760
	5′	32	61	104	153	215	289	480	724
	10′	27*	54	94	143	200	274	455	700
	15′	NR	46*	84	130	186	258	432	666

5B.7409

TABLE NO. 2—Continued

Height H	Lateral L	Vent Diameter—D							
		3″	4″	5″	6″	7″	8″	10″	12″
		Maximum Appliance Input Rating in Thousands of Btu per Hour							
15′	0	49	91	151	223	312	420	684	1040
	2′	39	72	122	186	260	350	570	865
	5′	35*	67	110	170	240	325	540	825
	10′	30*	58*	103	158	223	308	514	795
	15′	NR	50*	93*	144	207	291	488	760
	20′	NR	NR	82*	132*	195	273	466	726
20′	0	53*	101	163	252	342	470	770	1190
	2′	42*	80	136	210	286	392	641	990
	5′	38*	74*	123	192	264	364	610	945
	10′	32*	65*	115*	178	246	345	571	910
	15′	NR	55*	104*	163	228	326	550	870
	20′	NR	NR	91*	149*	214*	306	525	832
30′	0	56*	108*	183	276	384	529	878	1370
	2′	44*	84*	148*	230	320	441	730	1140
	5′	NR	78*	137*	210	296	410	694	1080
	10′	NR	68*	125*	196*	274	388	656	1050
	15′	NR	NR	113*	177*	258*	366	625	1000
	20′	NR	NR	99*	163*	240*	344	596	960
	30′	NR	NR	NR	NR	192*	295*	540	890
50′	0	NR	120*	210*	310*	443*	590	980	1550
	2′	NR	95*	171*	260*	370*	492	820	1290
	5′	NR	NR	159*	234*	342*	474	780	1230
	10′	NR	NR	146*	221*	318*	456*	730	1190
	15′	NR	NR	NR	200*	292*	407*	705	1130
	20′	NR	NR	NR	185*	276*	384	670*	1080
	30′	NR	NR	NR	NR	222*	330*	605*	1010

See figure 1 and notes for single appliance vents.

TABLE NO. 3—CAPACITY OF MASONRY CHIMNEYS AND SINGLE-WALL VENT CONNECTORS SERVING A SINGLE APPLIANCE

Height H	Lateral L	SINGLE-WALL VENT CONNECTOR DIAMETER—D To be used with chimney areas not less than those at bottom							
		3″	4″	5″	6″	7″	8″	10″	12″
		Maximum appliance input rating in thousands of Btu per hour							
6′	2′	28	52	86	130	180	247	400	580
	5′	25*	48	81	118	164	230	375	560
8′	2′	29	55	93	145	197	265	445	650
	5′	26*	51*	87	133	182	246	422	638
	10′	22*	44*	79	123	169	233	400	598
10′	2′	31	61	102	161	220	297	490	722
	5′	28*	56	95	147	203	276	465	710
	10′	24*	49*	86	137	189	261	441	665
	15′	NR	42*	79*	125	175	246	421	634
15′	2′	35*	67	113	178	249	335	560	840
	5′	32*	61	106	163	230	312	531	825
	10′	27*	54*	96	151	214	294	504	774
	15′	NR	46*	87*	138	198	278	481	738
	20′	NR	NR	73*	128*	184	261	459	706
20′	2′	38*	73	123	200	273	374	625	950
	5′	35*	67*	115	183	252	348	594	930
	10′	NR	59*	105*	170	235	330	562	875
	15′	NR	NR	95*	156	217	311	536	835
	20′	NR	NR	80*	144*	202	292	510	800
30′	2′	41*	81*	136	215	302	420	715	1110
	5′	NR	75*	127*	196	279	391	680	1090
	10′	NR	66*	113*	182*	260	370	644	1020
	15′	NR	NR	105*	168*	240*	349	615	975
	20′	NR	NR	88*	155*	223*	327	585	932
	30′	NR	NR	NR	NR	182*	281*	544	865
50′	2′	NR	91*	160*	250*	350*	475	810	1240
	5′	NR	NR	149*	228*	321*	442	770	1220
	10′	NR	NR	136*	212*	301*	420*	728	1140
	15′	NR	NR	124*	195*	278*	395*	695	1090
	20′	NR	NR	NR	180*	258*	370*	660*	1040
	30′	NR	NR	NR	NR	NR	318*	610*	970
Minimum Internal Area of Chimney-A Square Inches		19		28	38	50	63	95	132

See figure 2 and notes for single appliance vents.

TABLE NO. 4—CAPACITY OF TYPE B DOUBLE-WALL VENT SERVING TWO OR MORE APPLIANCES

Vent Connector Capacity

Total Vent Height "H"	Connector Rise "R"	Vent Connector Diameter—D												
		3"	4"	5"	6"	7"	8"	10"	12"	14"	16"	18"	20"	22"	24"
		Maximum Appliance Input Rating in Thousands of Btu per Hour													
6'	1'	26	46	72	104	142	185	289	416	577	755	955	1180	1425	1700
	2'	31	55	86	129	168	220	345	496	653	853	1080	1335	1610	1920
	3'	35	62	96	139	189	248	386	556	740	967	1225	1510	1830	2180
8'	1'	27	48	76	109	148	194	303	439	601	805	1015	1255	1520	1810
	2'	32	57	90	129	175	230	358	516	696	910	1150	1420	1720	2050
	3'	36	64	101	145	198	258	402	580	790	1030	1305	1610	1950	2320
10'	1'	28	50	78	113	154	200	314	452	642	840	1060	1310	1585	1890
	2'	33	59	93	134	182	238	372	436	730	955	1205	1490	1300	2150
	3'	37	67	104	150	205	268	417	600	827	1080	1370	1690	2040	2430
15'	1'	30	53	83	120	163	214	333	480	697	910	1150	1420	1720	2050
	2'	35	63	99	142	193	253	394	568	790	1030	1305	1610	1950	2320
	3'	40	71	111	160	218	286	444	640	898	1175	1435	1835	2220	2640
20'	1'	31	56	87	125	171	224	347	500	740	965	1225	1510	1830	2190
	2'	37	66	104	149	202	265	414	596	840	1095	1385	1710	2070	2470
	3'	42	74	116	168	228	300	466	672	952	1245	1575	1945	2350	2300
30'	1'	33	59	93	134	182	238	372	536	805	1050	1330	1645	1990	2370
	2'	39	70	110	158	215	282	439	632	910	1190	1500	1855	2240	2670
	3'	44	79	124	178	242	317	494	712	1035	1350	1710	2110	2550	3040
40'	1'	35	62	97	140	190	248	389	560	850	1110	1405	1735	2100	2500
	2'	41	73	115	166	225	295	461	665	964	1260	1590	1965	2380	2830
	3'	46	83	129	187	253	331	520	748	1100	1435	1820	2240	2710	3230
60' to 100'	1'	37	66	104	150	204	266	417	600	926	1210	1530	1890	2230	2720
	2'	44	79	123	178	242	316	494	712	1050	1370	1740	2150	2590	3090
	3'	50	89	138	200	272	355	555	800	1198	1565	1930	2450	2960	3520

Table No. 4

TABLE 4-A—Continued

COMMON VENT CAPACITY

Total Vent Height "H"	Common Vent Diameter													
	3"	4"	5"	6"	7"	8"	10"	12"	14"	16"	18"	20"	22"	24"
	Combined Appliance Input Rating in Thousands of Btu per Hour													
6'	—	65	103	147	200	260	410	588	815	1065	1345	1660	1970	2390
8'	—	73	114	163	223	290	465	652	912	1190	1510	1860	2200	2680
10'	—	79	124	173	242	315	495	712	995	1300	1645	2030	2400	2920
15'	—	91	144	206	280	365	565	825	1158	1510	1910	2360	2790	3400
20'	—	102	160	229	310	405	640	916	1290	1690	2140	2640	3120	3800
30'	—	118	185	266	360	470	740	1025	1525	1990	2520	3110	3680	4480
40'	—	131	203	295	405	525	820	1180	1715	2240	2830	3500	4150	5050
60'	—	NR	224	324	440	575	900	1380	2010	2620	3320	4100	4850	5900
80'	—	NR	NR	344	468	610	955	1540	2250	2930	3710	4590	5420	6600
100'	—	NR	NR	NR	479	625	975	1670	2450	3200	4050	5000	5920	7200

See figure 3 and notes for multiple appliance vents.

5BC 7409

be less than the area of the flue collar of the boiler or furnace to which it is connected.

(b) Each such breeching or connector pipe shall be made of material equal in durability to galvanized sheet metal of thickness (Galvanized Sheet Gauge) for the various diameters of such smoke pipes, shall be not less than the following:

Diameter of Connector	Sheet Gauge No.
LESS than 10"	24
10" to 12"	22
14" to 16"	20
18" to 20"	18
22" to 24"	16

TABLE NO. 5—
CAPACITY OF A SINGLE-WALL METAL PIPE OR TYPE B ASBESTOS CEMENT VENT SERVING TWO OR MORE APPLIANCES

Vent Connector Capacity

Total Vent Height "H"	Connector Rise "R"	Vent Connector Diameter—D					
		3"	4"	5"	6"	7"	8"
		Maximum Appliance Input Rating in Thousands of Btu per hour					
6'-8'	1'	21	40	68	102	146	205
	2'	28	53	86	124	178	235
	3'	34	61	98	147	204	275
15'	1'	23	44	77	117	179	240
	2'	30	56	92	134	194	265
	3'	35	64	102	155	216	298
30' and up	1'	25	48	84	129	190	270
	2'	31	58	97	145	211	295
	3'	36	68	107	164	232	321

Common Vent Capacity

Total Vent Height "H"	Common Vent Diameter						
	4"	5"	6"	7"	8"	10"	12"
	Combined Appliance Input Rating in Thousands of Btu per hour						
6'	48	78	111	155	205	320	NR
8'	55	89	128	175	234	365	505
10'	59	95	136	190	250	395	560
15'	71	115	168	228	305	480	690
20'	80	129	186	260	340	550	790
30'	NR	147	215	300	400	650	940
50'	NR	NR	NR	360	490	810	1190

See figure 3 and notes for multiple appliance vents.

TABLE NO. 6—
CAPACITY OF A MASONRY CHIMNEY AND SINGLE-WALL VENT CONNECTORS SERVING TWO OR MORE APPLIANCES

Single-Wall Vent Connector Capacity

Total Vent Height "H"	Rise Connector "R"	Vent Connector Diameter—D					
		3"	4"	5"	6"	7"	8"
		Maximum Appliance Input Rating in Thousands of Btu per hour					
6'-8'	1'	21	39	66	100	140	200
	2'	28	52	84	123	172	231
	3'	34	61	97	142	202	269
15'	1'	23	43	73	112	171	225
	2'	30	54	88	132	189	256
	3'	34	63	101	151	213	289
30' and up	1'	24	47	80	124	183	250
	2'	31	57	93	142	205	282
	3'	35	65	105	160	229	312

Common Chimney Capacity

Total Vent Height "H"	Minimum Internal Area of Chimney—"A" Square Inches					
	19	28	38	50	78	113
	Combined Appliance Input Rating in Thousands of Btu per hour					
6'	45	71	102	142	245	NR
8'	52	81	118	162	277	405
10'	56	89	129	175	300	450
15'	66	105	150	210	360	540
20'	74	120	170	240	415	640
30'	NR	135	195	275	490	740
50'	NR	NR	NR	325	600	910

See figure 4 and notes for multiple appliance vents.

TABLE NO. 7

TABLE FOR REDUCING CLEARANCES

Clearances, Inches, With Specified Forms of Protection.*

Type of Protection Applied to the combustible material and covering all surfaces within the distance specified as the required clearance with no protection. (See Fig. 1). Thicknesses are minimum.	Where the required Clearance with no protection is: 36 inches	18 inches	9 inches	6 inches
(a) ¼ in. asbestos millboard spaced out 1 in.†	30	12	6	3
(b) 28 gage sheet metal on ¼ in. asbestos millboard	24	12	4	2
(c) 28 gage sheet metal spaced out 1 in.†	18	9	4	2
(d) 28 gage sheet metal on ⅛ in. asbestos millboard spaced out 1 in.†	18	9	4	2
(e) ¼ in. asbestos millboard on 1 in. mineral wool bats reinforced with wire mesh or equivalent	18	6	4	2
(f) 22 gage sheet metal on 1 in. mineral wool bats reinforced with wire or equivalent	12	3	2	2

*All clearances shall be measured from the outer surface of the connector to the combustible material disregarding any intervening protection applied to the combustible material but in no case shall the clearance be such as to interfere with the requirements for accessibility.

†Spacers shall be of noncombustible material.

TABLE NO. 8

Chimney Connector and Vent Connector Clearances from Combustible Materials

Description of Appliance	Minimum Clearance, Inches (See Note 1)
RESIDENTIAL TYPE APPLIANCES	
Column 1, Appendix A	
Single-Wall Metal Pipe Connectors	
Gas Appliances Without Draft Hoods	18
Electric, Gas, and Oil Incinerators	18
Oil and Solid-Fuel Appliances	18
Unlisted Gas Appliances With Draft Hoods	9
Boilers and Furnaces Equipped With Listed Gas Burners and With Draft Hoods	9
Oil Appliances Listed as Suitable For Use With Type L Venting Systems, but only when connected to chimneys.	9
Listed Gas Appliances With Draft Hoods. See Note 3.	6
Type L Venting System Piping Connectors	
Gas Appliances Without Draft Hoods	9
Electric, Gas, and Oil Incinerators	9
Oil and Solid-Fuel Appliances	9
Unlisted Gas Appliances With Draft Hoods	6
Boilers and Furnaces Equipped With Listed Gas Burners and With Draft Hoods	6
Oil Appliances Listed As Suitable For Use With Type L Venting Systems	(See Note 2)
Listed Gas Appliances With Draft Hoods	(See Note 3)
Column 1, Appendix B	
Type B Gas Vent Piping Connectors	
Listed Gas Appliances With Draft Hoods	(See Note 3)
COMMERCIAL-INDUSTRIAL TYPE APPLIANCES	
Low-Heat Appliances	
Column 2, Appendix A	
Single-Wall Metal Pipe Connectors	
Gas, Oil, and Solid-Fuel Boilers, Furnaces, and Water Heaters	18
Ranges, Restaurant Type	18
Oil Unit Heaters	18
Unlisted Gas Unit Heaters	18
Listed Gas Unit Heaters With Draft Hoods	6
Other Low-Heat Industrial Appliances	18
Medium-Heat Appliances	
Column 3, Appendix A	
Single-Wall Metal Pipe Connectors	

NOTE 1: These clearances apply except if the listing of an appliance specifies different clearance, in which case the listed clearance takes precedence.

NOTE 2: If listed Type L venting system piping is used, the clearance may be in accordance with the venting system listing.

NOTE 3: If listed Type B or Type L venting system piping is used, the clearance may be in accordance with the venting system listing.

The clearances from connectors to combustible materials may be reduced if the combustible material is protected in accordance with Table 2.

SIZING OF VENTING SYSTEMS SERVING APPLIANCES EQUIPPED WITH DRAFT HOODS

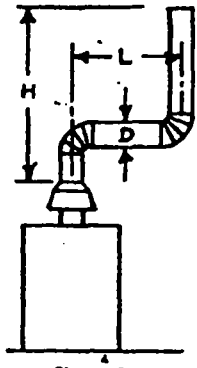


Figure 1

Double Wall or Asbestos Cement Type B Vents or Single-Wall Metal Vents Serving a Single Appliance. (See Tables 1 and 2.)

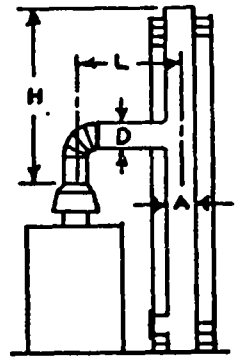


Figure 2

Masonry Chimney Serving a Single Appliance. (See Table 3.)

NOTES FOR SINGLE APPLIANCE VENTS. (See Tables 1, 2 and 3.)

(1) In no case shall the vent serving gas burning equipment be smaller in size than the draft hood outlet.

(2) "0" Zero lateral "L" applies only to a straight vertical vent attached to a top outlet draft hood.

(3) Designation "NR" in Tables 1, 2 and 3 indicates not recommended.

(4) Number followed by an asterisk (*) in Tables 2 and 3 indicate the possibility of continuous condensation, due to the flue gas temperature falling below the dew point temperature at some point in the vent or chimney.

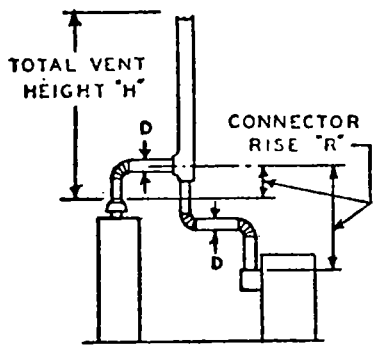


Figure 3

Double-Wall or Asbestos Cement Type B Vents or Single-Wall Metal Vents Serving Two or More Appliances. (See Tables 4 and 5.)

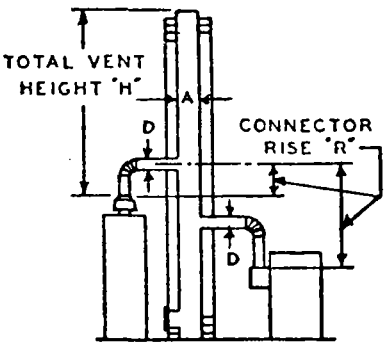


Figure 4

Masonry Chimney Serving Two or More Appliances. (See Table 6.)

NOTES FOR MULTIPLE APPLIANCE VENTS. (See Tables 4, 5 and 6.)

1. Maximum Vent Connector Length 1½ feet for every inch of connector diameter. Greater lengths require increase in size, rise or total vent height, to obtain full capacity.

2. Each 90-degree turn in excess of the first two reduces the connector capacity by 10 per cent (10%).

3. Each 90-degree turn in the common vent reduces capacity by 10 per cent (10%).

4. Where possible, locate vent closer to or directly over smaller appliance connector.

5. Connectors must be equal to or larger than draft hood outlets.

6. If both connectors are same size, common vent must be at least one size larger, regardless of tabulated capacity.

7. Common vent must be equal to or larger than largest connector.

8. Interconnection fittings must be same size as common vent.

9. Use sea level input rating when calculating vent size for high altitude installation.

10. Designation "NR" in Tables 4, 5 and 6 indicates not recommended.

EXAMPLE OF MULTIPLE VENT DESIGN USING TABLE 4 DOUBLE WALL TYPE B VENT

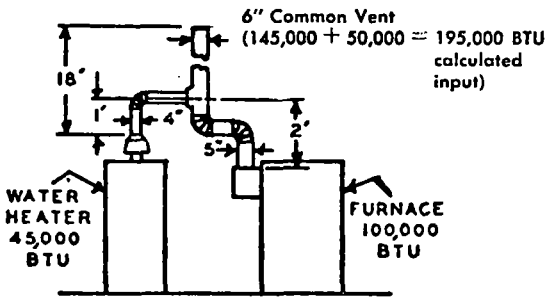


Figure 5

EXAMPLE: Connect a 45,000 BTU water heater with a 1 foot connector rise "R" and a 100,000 BTU furnace with a 2 foot connector rise "R" to a common vent with a minimum total vent height "H" of 18 feet. See Figure 5.

1. WATER HEATER VENT CONNECTOR SIZE.

Using Table 4, read down Total Vent Height "H" column to 15 feet and read across 1 foot connector rise "R" line to BTU rating equal to or higher than water heater input rating. This figure shows 53,000 BTU and is in the column for four-inch connector. Since this is in excess of the water heater input it is not necessary to find the maximum input for an 18 foot minimum total vent height. Use a four-inch connector.

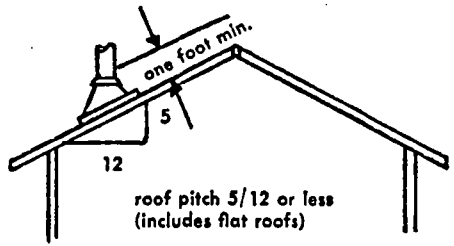
2. FURNACE VENT CONNECTOR SIZE.

Under Vent Connector Tables read down Total Vent Height "H" column to 15 foot and read across 2 foot Connector Rise "R" line. Note 5 inch vent size shows 99,000 BTU per hour or less than furnace input. However, with 20 foot Total Height read across 2 foot connector rise line. Note 5 inch vent size shows 104,000 BTU per hour. Since 18 foot height is 3/5th of difference between 15 and 20 foot heights take difference between 99,000 and 104,000 or 5,000 and add 3/5ths of this to 15 foot figure of 99,000, 99,000+ 3,000=102,000 which is maximum input for 18 foot Total Vent Height. Therefore a 5 inch connector would be the correct size for the furnace, providing the furnace had a 5 inch or smaller draft hood outlet.

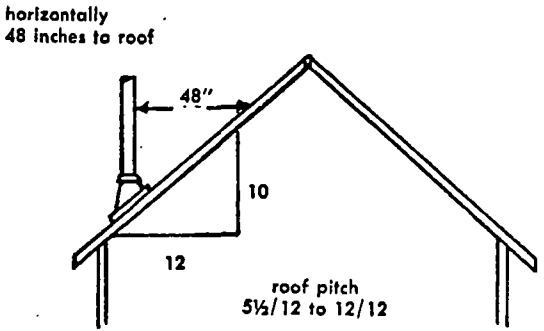
3. COMMON VENT SIZE.

Adding 50,000 BTU to the input of 45,000 BTU for the water heater and 100,000 BTU input for the furnace gives a total calculated input to the Common Vent of 195,000 BTUs.

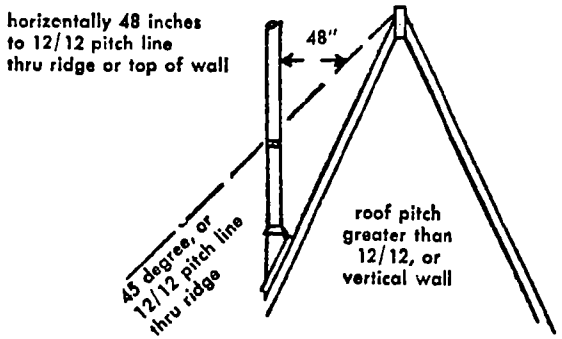
Note that for 15 foot Total Vent Height "H" maximum BTU input for 6 inch vent is 206,000. Therefore the common vent must be 6 inch.



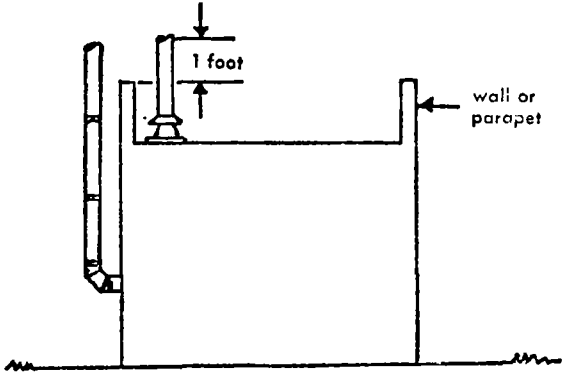
A ROOF PITCH 5′/12′ (22½°) OR LESS.
Maintain minimum clearance of 12 inches as illustrated.



B ROOF PITCH 5½′/12′ AND UP TO 12′/12′ (45°)
Maintain 48 inches horizontal distance from lowest top opening and roof surface.



C ROOF PITCH GREATER THAN 12′/12′
Maintain 48 inches distance from 45° pitch line through roof ridge.



D VENT WITHIN 30 INCHES OF VERTICAL WALL, parapet, or roof ridge. Top should be located one foot above wall or ridge.

Figure 6

SBC 7501 WARM AIR HEATING. General. For fundamental and basic design data and information see Chapter 73, References.

SBC 7502 Warm Air Heating Systems. Warm air heating systems are generally classified as gravity warm air and forced or mechanical warm air. This Code will deal primarily with the design and installation of mechanical warm air heating systems. Gravity warm air heating systems reference should be made to "Gravity Code and Manual for the Design and Installation of Gravity Warm Air Heating Systems" published by the National Warm Air Heating and Air Conditioning Association in Manual 5.

SBC 7503 Definitions. For the purpose of this Code, the following terms shall mean:

MECHANICAL WARM AIR HEATING PLANT. One or more warm air furnaces enclosed within casings, together with necessary appurtenances thereto, consisting of warm air supply pipes and fittings, cold air or recirculating pipes, ducts, boxes and fittings, smoke pipes, dampers and registers, grilles, fans, or blowers, the same being intended for heating the buildings in which they may be installed. The circulation of air within such a system shall be dependent upon the motive power furnished by a fan or blower, and the duct work in connection therewith shall be designed especially for such system. However, the incorporation of a booster fan, blower or any power driven device for the purpose of accelerating the air circulation in a gravity warm air heating plant shall be construed as changing the classification of such gravity system to a mechanical system.

(a) The incorporation of an air washer, filters, humidifier, cooling coils, automatic controls or other devices shall not be construed as changing the classification of such a system unless by incorporation of some one or more of the above, mentioned devices such system fulfills the requirements of one of the classifications immediately following.

WARM AIR ALL-YEAR AIR CONDITIONING SYSTEM. Includes a mechanical warm-air heating plant, such as hereinbefore defined, together with such other devices and such automatic controls as will secure the simultaneous control of the temperature, motion, humidity, and a reduction in the dust and odor content, of the air employed in the ventilation of rooms. This includes both warming and humidifying in winter and cooling and dehumidifying in summer.

WARM AIR WINTER AIR CONDITIONING SYSTEM. Includes a mechanical warm air heating plant, such as hereinbefore defined, together with such other devices and such automatic controls as will secure the simultaneous control of the temperature, motion, humidity, and a reduction in the dust and odor content, of the air employed in the ventilation of rooms, but not provided with such devices and automatic controls as will provide for cooling and dehumidifying in summer.

SBC 7504 Amount of Air Circulated. The amount of air to be provided for each room or space to be heated or conditioned shall be not less than that determined in the following manner:

(1) Calculate the heat loss, in BTU per hour, for each room or space to be heated, as set forth in Chapter 73.

(2) Calculate the volume of air to be circulated to each room or space to be heated, using the formula:

$$Q = \frac{H}{68.7}$$

Where:

Q=Volume of air in cubic feet per minute.

H=Calculated heat loss in BTU per hour.

68.7=A constant based on supply air temperature of 135 degrees F. and return air temperature of 65 degrees F.

The above formula is based on actual BTU per hour heat loss plus 10% safety factor.

SBC 7505 Duct Design

(1) Ducts may either be round or rectangular. Rectangular ducts should be as nearly square as possible. Aspect ratios greater than 8 to 1 shall not be exceeded and where possible, a ratio of 4 to 1 or less should be maintained. The radii of elbows shall be not less than one-half the pipe diameter, for round pipes, or the equivalent round pipe size in the case of rectangular ducts. However, in old buildings, where strict compliance with the foregoing provisions in regard to the elbows would be impracticable, special permission may be granted for deviations.

(2) The ducts or piping may be designed either as a trunk line system or as a system of individual ducts from the furnace to each register. Individual ducts may be grouped to simulate a trunk duct system in appearance.

(3) Calculate the sizes of all main and branch ducts by either of the following methods.

(a) VELOCITY METHOD: Arbitrarily fix the velocity in the various sections, reducing the velocity from the point of leaving the fan to the point of discharge to the room. In this case the pressure loss of each section of the duct is calculated separately and the total loss is found by adding together the losses of the various sections.

(b) FRICTION PRESSURE LOSS METHOD: Proportion the duct for equal friction pressure loss per foot of length.

SBC 7506 Total Resistance Determined. Calculate the friction of the duct, both supply and return, which offers the greatest resistance to the flow of air. This shall include the resistance of all elbows or other fittings, registers, and air inlet. Add to this the resistance of filters, air washer, furnace, or other devices located in the air stream. The result, plus a 10% factor of safety, will be the total resistance of the system, which shall be used in the selection of the fan or blower.

Friction losses for ducts and fittings shall be determined in accordance with the best engineering practices. Resistance of furnace, filters, air washers, cooling coils and other devices shall be taken from the various manufacturers' ratings certified as to correctness.

SBC 7507 Maximum Allowable Velocities. The air velocities, in feet per minute, shall not be exceeded in the various types of installations to which they apply. (See Table No. 4)

SBC 7508 Dampers. In an individual duct system, such duct shall be provided with a volume damper with substantial mounting and positive locking device.

In a trunk system, each branch duct shall be provided with a splitter damper where it leaves the main trunk duct, and with additional splitter dampers if again divided, or branch duct be provided with a volume damper. In finished or inaccessible areas in lieu of splitter or branch volume dampers, a friction type register box damper may be used. Where main duct branches into two or more trunks leaving fan, each trunk shall be provided with volume or squeeze damper to regulate air volume in each trunk. All dampers shall be provided with positive locking devices.

Warm air supply ducts shall not be installed for the purpose of heating attached private garages from any forced air system serving habitable areas.

SBC 7509 Supply Air Registers. All supply registers shall be securely fastened to connecting pipe and shall be effectively sealed against leakage around the borders or margins to prevent streaking of walls. The supply outlet size and its pressure loss should be selected from the manufacturers' engineering data.

SBC 7510 Return Air Registers. Return air registers shall be made of metal, plastic or wood. The free area shall be at least equal to the free area of the duct or ducts to which they are connected.

SBC 7511 Construction of Ducts. In connection with any mechanical warm air heating or air conditioning system, the construction of all sheet metal duct work hereafter installed shall be in accordance with SBC 7724 and SBC 7725.

SBC 7512 Underground Duct Construction and Installation. Underground duct installation for Warm Air Heating System shall be in accordance with SBC 7726.

SBC 7513 Size of Furnace

(1) Add together the hourly BTU heat losses of the various rooms of the building or space to be heated, as determined by the calculated requirements set forth in Chapter 73. For continuously heated buildings, install a furnace with a capacity or register delivery not less than that determined. For intermittently heated buildings, add from 25 to 150% of the net calculated heat loss.

(2) Hand-fired furnaces, converted to gas, oil, or stoker firing and having a ratios of heating surface to grate area greater than 15 to 1, register delivery equals 2265 x S.

(3) Hand-fired furnaces with ratios of heating surface to grate area greater than 15 to 1 and less than 25 to 1, register delivery equals 2265 x S.

(4) Hand-fired furnaces, with ratios of heating surface to grate area in excess of 25 to 1, register delivery equals 2265x25xG.

WHERE:

Register Delivery is in terms of BTU per hour.

S=Heating surface in square feet.

G=Actual grate area. in square feet.

SBC 7514 Gas, Oil, Electric or Stoker Fired Furnaces. The register delivery or net output rating expressed in BTU per hour/of an automatically fired furnace designed for the exclusive use of but one fuel shall be determined by means of the following:

(1) For gas-fired forced air furnaces the register delivery shall be 0.65 times the input in BTU per hour.

(2) For gas-fired unit heaters the register delivery shall be 0.75 times the input in BTU per hour.

(3) For oil-fired forced air furnaces the register delivery shall be 2265 times the heating surface in square feet.

(4) For stoker-fired forced air furnaces, the register delivery shall be 2265 times the heating surface in square feet.

(5) For electric forced air furnaces the register delivery shall be 0.85 times the input in BTU per hour.

SBC 7515 Furnace Foundations

(1) Furnace foundations of brick, cement, or other incombustible material shall be provided.

(2) Where it is necessary to place a furnace on a combustible floor, not less than 4 inches of hollow tiles shall be used, having joints matched in such a way that air passage will be free from side to side. Such foundation shall be constructed upon and covered with continuous sheet metal plates, of weight not less than 24 U.S. Standard Gauge Metal, having all joints riveted or double seamed and the bottom of the sheet to have all edges turned up at least one inch. This floor covering shall extend under the whole of the fire box of the furnace and outwardly not less than 12 inches on all sides and rear of casing, or base ring, and 36 inches in front.

(3) Warm air furnaces manufactured and with underwriters approval for mounting directly on combustible materials are approved for such installations.

SBC 7516 Smoke Pipes. Smoke pipes shall be constructed and installed in accordance with provisions of Chapter 74.

SBC 7517 Basic Controls. Mechanical warm air heating and air conditioning systems shall be equipped with automatic controls capable of performing at least the following minimum functions:

(1) OIL FIRED FURNACES. At least 3 controls shall be employed as follows: Control No. 1 will stop the burner when the room temperature is too high and No. 2 will stop the burner when the temperature of the air in the plenum chamber or mainduct exceeds the setting of Control No. 2. Both temepratures must be below their respective settings to start the burner. Control No. 3 responds to the flame temperature and in conjunction with the control switch acts as a safety to stop the burner if the latter fails to ignite or burn properly as demanded by Controls No. 1 and 2.

(2) Gas-Fired Furnace. Shall employ Controls No. 1 and No. 2 as for oil fired furnaces. Either a thermostatic pilot, so constructed and adjusted that no gas can flow through the main burner unless the pilot flame is burn-

ing, or some other type of safety device serving this same end shall be employed. The operation of this safety device shall not depend on the closing of an electrical circuit to shut off the main gas supply. A gas pressure regulator shall be installed in accordance with Chapter 79.

SBC 7518 Noise Elimination. In residential installations the fan or blower housing shall not be directly connected with metal, either to the furnace casing or to the return air piping. Canvas strips may be used in making these connections. Motors shall be mounted in such a way that vibration will not be transmitted to duct work or equipment.

Electrical conduit and water piping shall not be fastened to, nor make contact with, fan housing.

SBC 7519 Warm Air Furnace Standards

(1) Gas-Fired Furnaces.

(a) All gas-fired furnaces shall be rated in accordance with the American Standard Approval Requirements for Central Heating Gas Appliances, Vol. II, Gravity and Forced Air Central Furnaces ANSI Z21-47 and ANSI Z21-47a.

(b) All gravity furnaces approved by the American Gas Association under these requirements are assigned a rating based on 75% efficiency and forced air furnaces are assigned a rating based on 80% efficiency.

(2) Oil-Fired Furnaces.

(a) Oil-fired furnaces equipped with pressure atomizing or rotary burners shall be rated in accordance with Commercial Standard 195.

(b) Furnaces equipped with pot-type oil burners should be rated in accordance with Commercial Standards 104.

(c) Oil-burning floor furnaces should be rated in accordance with Commercial Standard 113.

(d) Oil furnaces which come as complete packages, including the burner and control equipment, shall be identified as follows:

(1) Pressure-type or rotary burners included as a part of the package should bear the Underwriters' Laboratories label showing compliance with UL 296 and Commercial Standard Label C.S. 75.

(2) The complete furnace should bear the UL 727 label and so listed. It may also be certified by the manufacturers as complying with Commercial Standard 195.

(3) Vaporizing burner furnaces should also be listed under U.L. 727 and C.S. 104.

SBC 7601 STEAM AND LIQUID SYSTEMS. Scope. This chapter of the code shall include work done and materials used in the installation of all boilers, piping, apparatus and appurtenances proper to steam and hot water heating and chilled water cooling; steam piping systems, and liquid piping systems including control piping and the alterations to such systems.

SBC 7602 Definitions. ACCESSIBLE INSTALLATION means to be accessible, such as exposed in shafts, tunnels, or concealed by readily, removable enclosing construction.

ALTERATION—changes, replacements, additions, or removal of components of a system with resulting significant effect on the performance of the system or its parts.

A.S.H.R.A.E.—refers to the American Society of Heating, Refrigeration, and Air Conditioning Engineers.

A.S.M.E.—refers to the American Society of Mechanical Engineers.

A.S.T.M.—refers to the American Society of Testing Materials.

BLOW-OFF is a connection to a boiler or other device for the purpose of the blow-down of scale, sludge, etc.

CAPILLARY BRAZING refers to the joining of tube and socket designed fittings, with proper tolerances, for the capillary attraction of a brazing alloy above 1000° F. melting temperature.

CONVERTOR—a device which transfers heat from one gas or liquid to another gas or liquid wherein there is no direct contact between the two gases or liquids.

COOLING PIPING AND EQUIPMENT. The term cooling piping and equipment shall include all piping and equipment containing water or other liquid and designed and installed for the purpose of cooling in connection with any air conditioning or other process but shall include cooling piping and equipment in which a refrigerant is used.

DISTRICT HEATING OR COOLING refers to the supply of heat or cooling from a central plant to a group of buildings.

DRAIN CONNECTION is the connection for emptying a boiler or system.

F.S.—refers to Federal Specifications.

HEAT EXCHANGER—see CONVERTOR.

LIQUID PIPING SYSTEM shall mean a system in which water or other liquid is used as the medium by which heat is carried through pipes from the supply source to or from the heating or cooling units.

INACCESSIBLE INSTALLATION refers to those sections of piping systems installed in walls, floors, ceilings and other areas where access cannot be made without the removal of permanent construction.

INTERFACE. The surface that lies between two dissimilar parts of matter or space forming their common boundary.

MAY means optional.

PERMANENT means lasting or intended to last.

SHALL means mandatory.

STEAM HEATING SYSTEM shall mean a heating system in which heat is transferred from a source of steam to steam heating units at, above or below atmospheric pressure.

STEAM PIPING SYSTEM shall mean a system in which steam is transferred from a source to a steam utilizing device at, above or below atmospheric pressure for a purpose other than for heating a building or other structure.

TEMPERATURE. All reference to temperatures are for Fahrenheit scale.

UNDERGROUND. Underground installations shall include those pipes buried in slabs embedded in concrete or masonry materials all below ground.

MULTIPLE DWELLING SYSTEM. The term multiple dwelling refers to those heating systems serving three or more living units from the same source.

SBC 7603 Boilers

(1) Construction. All boilers shall be constructed in accordance with Section IV of the current edition, of the A.S.M.E. Boiler and Pressure Vessel Code, or the Power Boiler Code, Section I.

(2) Capacity.

(a) Selection. Heating boilers shall be selected commensurate with the gross load imposed on the boiler. The general factors to be considered are as follows:

(1) Radiation load—The estimated heat emission in BTU of the connected radiation and such heat emission shall at least equal the calculated heat loss of the space to be heated. See Chapter 73.

(2) Hot water supply load—The estimated maximum heat in BTU required to heat water for purposes other than space heating.

(3) Piping loss load—The estimated heat emission in BTU from the piping which connects the radiation to the boiler.

(4) Pick up allowance—The estimated increase in the normal load in BTU caused by the heating up of the cold system.

Items (1) and (2) of the foregoing constitute what is known as the "net load".

The boiler capacity to be installed shall be as published by the Institute of Boiler and Radiator Manufacturers, the Steel Boiler Institute, or the Mechanical Contractors Association of America.

In the determination of boiler capacity, consideration shall be given to conditions which could give rise to special problems of piping loss and pick up load. Also, the possibility of efficiencies other than the 80% usually credited to automatically fired boilers must be taken into account.

In the case of electric heat boilers, the efficiency can be taken as 100% but the piping loss load and pick up allowance shall be considered the same as for boilers using fossil fuels.

SBC 7604 System Design. System design features and the sizing of steam, hot and chilled water and/or liquid piping systems shall be consistent with the practices presented in the American Society of Heating, Refrigeration, and Air Conditioning Guide, copies of which are on file in the Department of Administration.

SBC 7605 Manufacturer's Recommendation. All equipment and materials shall be installed in accordance with the manufacturer's recommendation, subject to the approval of the administrative authority. However, in the case of conflict between a manufacturer's recommendation and the limitations or provisions of this code, this code shall supercede.

SBC 7606 Material Standards. The material standards listed in Annex I to this chapter shall conform at least, to the standards cited, when used within the scope of this code for the construction, installation, alteration or repair of any part of a system.

(1) Insofar as is the custom or practice of manufacturers, all materials must be marked and suitably identified so as to provide a visual means of identification as to types, grades, weights and strengths. This shall be accomplished as part of the manufacturing process.

(2) The installer will position the above identification marks so as to provide the easiest inspection by the administrative authority within the limits of practibility.

(3) All materials should be handled carefully so as to avoid damage. No defective or damaged materials, equipment, nor apparatus shall be knowingly installed.

(4) In using the materials approved, provisions of SBC 7609 in joints and connections shall be strictly observed.

(5) The manufacturers working pressure rating of all system components shall be in excess of the highest operating pressure at any point in the system.

SBC 7607 Application of Materials (Accessible Installation). All materials in Annex I may be installed with the limits of standard engineering practices and with strict accordance with Chapter 76, Section SBC 7609 on joints and connections for accessible installation.

The application of plastic pipe is further limited to 120 degrees F. maximum temperature.

SBC 7608 Application of Materials (Inaccessible Installations). The following limitations are placed on materials in Annex I when used for inaccessible installations:

(1) No cast brass or bronze fittings are permitted if capillary brazing is the joining method.

(2) The minimum copper tube allowed is type "L" except that type "M" may be used in wood frame construction. Type "M" shall not be used in steam systems.

(3) No plastic pipe permitted in any system operating in excess of 120 degrees F.

(4) Unions, valves and flare or compression connections not permitted.

SBC 7609 Joints and Connections. All joints and connections shall be gas or water tight to the strength standards of the particular type of joint or connection employed.

THE TYPES OF APPROVED CONNECTIONS ARE AS FOLLOWS:

(1) Threaded connections shall conform to the American National Taper Pipe Thread. ASA B-21 or F.S. GGG-P-351a. All burrs are to be removed. Pipe shall be reamed. Pipe joint compound shall be used on male thread only.

(2) Soldered connections shall be thoroughly cleaned and fluxed with non-corrosive flux. Soft solder used for joints shall have a nominal composition of 50% tin and 50% lead for piping not to exceed 160 degrees F., a nominal composition of 95% tin and 5% antimony for piping not to exceed 250 degrees F. and conforming to ASTM Standard B-32.

(3) Capillary brazed connections shall be thoroughly cleaned and fluxed with a suitable flux. Brazing material shall conform to ASTM Standard for filler metal B-260.

(4) Flared connections for soft copper tubing shall be made with fittings meeting ASA Standards. The tubing shall be reamed and expanded with proper flaring tools.

(5) Flareless connections for soft copper tubing shall be made with fittings meeting ASA Standards. When a bite-type fitting is used, the joint shall first be made up tight, then dis-assembled to make sure the depth of "bite" is adequate and then reassembled.

(6) Expansion joints shall be of an approved type, installed in accordance with the manufacturer's recommendations. Every expansion joint, other than an expansion loop, shall be accessible. Anchors, and guides shall be provided as necessary to prevent undue strain or deflection on piping systems or building structures.

(7) Welded connections. The welding procedure shall be such as to assure substantially full root penetration and thorough fusion of the deposited metal with the base metal.

(a) The administrative authority reserves the right to question the competency of a welder for any welded connections made in the installation of all piping systems. In case of a disagreement as to the competency of the welder, tests may be requested by the administrative authority and the costs for such testing to be borne by the contractor; or at the contractor's option, a certificate of proficiency from a recognized testing agency attesting to the skill of the welder may be required as an alternate to such tests.

(b) Paragraph (a) above shall not relieve the requirements for certified welding where otherwise required by code.

(8) The bending of pipe or tube is permissible provided that no kinks or excessive flattening of the pipe or tube results. Such bending must be done under a controlled process and minimum bending radii in accordance with Table 1.

TABLE NO. 1

Minimum Bending Radii and Tangent

Nominal pipe size in inches	Std. wall and heavier Min. bending radii in inches	Minimum tangents for pulling and holding plain or beveled end in inches
1	5	6
1¼	6¼	6
1½	7½	6
2	10	6
2½	12½	8
3	15	8
4	20	10

NOTE: The radius is measured to the center line of the pipe.

SBC 7610 Underground. Where piping is run underground or embedded in concrete or masonry, no threaded joints shall be used except as in (4) below. Where solder joint fittings are used, for nonferrous piping the capillary brazing alloys shall be used. Underground piping shall not be placed on nor covered with fill containing cinders.

(1) Piping embedded underground as defined in this code shall be embedded completely and shall not rest on an interface. Supports for positioning the piping should be non-absorbent and inorganic. Reinforcing steel, angle iron, pieces of pipe, or stone or concrete mounds may be used. No wood, brick, concrete block, or similar materials shall be used for support of the piping.

(2) Where piping is embedded in structural load supporting slabs, above grade, construction codes may affect their position. In general, their position should not be less than ¾ inch from external face.

(3) Steel and wrought iron pipe joints to be installed in contact with the earth shall be coated with a bituminous enamel, or approved equal, to prevent deterioration of the pipe from external causes.

(4) Threaded joints may be used underground if encased in conduit to protect the pipe and/or insulated from external damage; and to provide space in which the pipe is free to expand and contract while held in proper alignment. All joints to be coated with bituminous enamel or approved equal.

(5) The minimum copper tube allowable for underground is Type L.

(6) No cast brass or bronze fittings are permitted.

(7) Connections to be made underground shall be by fusion welding or capillary brazing except as otherwise noted.

(8) All piping shall be subjected to a hydrostatic test of at least one and one half times the design operating pressure, for four hours duration, but not less than 100 PSIG, witnessed by the administrative authority.

When there is a possibility of freezing, testing may be accomplished by using air to the above prescribed minimum pressure for 24 hours duration.

(9) Where piping enters and exits concrete it shall be surrounded with a compressible material having a minimum thickness of ½ inch and extending a minimum of 6 inches underground.

(10) Piping run underground containing liquids or steam at a greater than 20 degree difference from underground temperature shall be insulated and protected from moisture except for properly designed panel heating and snow melting systems.

(11) Plastic pipe shall not be used underground.

SBC 7611 Isolation of Major Components. All liquid and steam systems except those serving single and two family dwellings shall be provided with a means of isolating the boilers, (except in the case of single steam boilers) with motorized valves, pumps and other devices subject to repairs, so that such repairs can be made without draining or removing the pressure of the remaining parts of the system. In some cases the isolation of certain loops or risers may fulfill this requirement, subject to the approval of the administrative authority. Union or flanged connections shall be provided for pumps and coils.

SBC 7612 Pressure Relief and Safety Valve. Each hot liquid boiler or heat exchanger shall be equipped with a pressure relief valve and each steam boiler with a safety valve. All pressure relief and safety valves shall be rated and installed in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

(1) Discharge piping from safety and relief valves shall be led to a position such that the danger of scalding any person is minimized, and away from operating controls, thus preventing damage thereto.

(2) Inlet and discharge pipes are to be full size of valve opening and the discharge end shall be reamed and unthreaded.

(3) When manifolding two or more valve discharges, the piping shall be sized so that its area is equivalent or greater than the combined areas of the discharge openings.

(4) Discharge piping, from safety or relief valve, when rising up shall be provided with a drain opening to prevent the accumulation of condensate at the valve.

(5) The required relieving capacity of the pressure relieving device or devices on a boiler or heat exchanger shall be equal to, or greater than, the maximum output of the boiler or heat exchanger.

(6) To prevent excessive loss of relieving capacity of the discharge piping because of length of pipe, such discharge piping shall be increased in size.

SBC 7613 Blow Off and Drain Piping. The end of the blow off piping from any boiler or the vent pipe from any blow off tank shall not terminate in any location where the discharge can endanger the safety of any person or property.

The exhaust, blowoff, or drain from a boiler or heat exchanger shall not connect directly with any sewer, waste, vent pipe, or rain water leader, but may connect indirectly.

All such pipes from a high pressure steam source, shall be indirectly connected by discharging into a blow off tank or condenser as required by the State of Minnesota High Pressure Steam Code.

All such pipes from low pressure steam boilers and hot water boilers rated at 150 horsepower or more shall also discharge into a blow off tank or condenser as required by the State of Minnesota High Pressure Steam Code.

In a similar manner, all other such pipes which would cause a discharge of steam or water to enter the sewer above 80° F. for a period of more than ten minutes shall be equipped with a means of lowering the entering temperature below 180° F. This provision is not meant to be applied to boilers or heat exchangers which are drained on rare occasions. Drains from pressing machines and similar equipment may waste into an open floor drain.

Any closed condenser or sump shall be provided with a relief vent not less than one pipe size larger than the largest inlet, which relief pipe or vent should be taken off the top, and extend separately full size through the roof.

SBC 7614 Controlling Devices. All boilers shall be provided with a minimum of two independently operated controls consisting of an operating control and a high limit control for shutting off fuel supply.

SBC 7615 Mixing of Radiation. There should be no intermixing of different types of cast iron radiation or Fintube radiation and coils on a common circuit zone.

SBC 7616 Low Water Cut-offs. Each automatically fired steam boiler shall be equipped with an automatic low water fuel cut-off to automatically cut off the fuel supply when the surface of the water falls to the lowest safe water level.

(1) Each automatically fired hot water boiler having a rated output in excess of 400 M.B.H. shall be equipped with an automatic low water fuel cut-off to automatically stop the fuel supply when the surface of the water falls not lower than the lowest safe permissible water level established by the boiler manufacturer.

(2) All boilers installed at elevations where all radiation in the system is below the safe boiler water level should be equipped with an automatic low water fuel cut-off to automatically stop the fuel supply when the surface of the water falls not lower than the lowest safe permissible water level established by the boiler manufacturer.

SBC 7617 Piping Support. All piping shall be securely supported by metal hangers or other approved hangers, so spaced that there will be no sag in piping between points of suspension, and where run on walls shall be securely supported by metal brackets or pipe supports similarly spaced. Supports shall be so arranged that there will be no undue strain on the threads of any pipe or fittings and equipment connected thereto. Contact between pipe and dissimilar metals shall be avoided.

The maximum spacing of hangers and minimum hanger rod size for steel and copper pipe 2" and larger shall be as follows:

TABLE No. 2

Nominal Pipe Size Inches	Maximum Span Feet	Minimum Rod Diameter Inches
3	10	⅜
3	12	½
3½	13	½
4	14	⅝
5	16	⅝
6	17	¾
8	19	⅞
10	22	⅞
12	23	⅞

SBC 7618 Expansion and Contraction. In all piping systems which are subject to expansion and contraction, provision shall be made for adequate anchorage and protection against damage to piping from such expansion and contraction. All risers shall be so anchored and safeguarded that the difference in length, when hot, from the length when cold, shall not disarrange the necessary provisions for drainage of the branches or distort, damage or displace radiators or other equipment.

SBC 7619 Clearance of Piping. Pipes passing through walls, ceilings, floors, or beams shall be provided with clearance or sleeved. When pipes are to be covered, clearance between pipe and sleeve shall accommodate the covering.

SBC 7620 Tee Connection. Bull-headed tee connections should be avoided whenever possible. Whenever such connections cannot be avoided, flow balancing cocks shall be provided in the split circuits.

SBC 7621 Reducers. Change of pipe sizes in horizontal runs shall be by means of eccentric reducers or reducing tees properly oriented to prevent undesirable trapping of air, vapor, steam or water at the connecting joint.

SBC 7622 Water Supply Fill Connections. Water fill connections to steam boilers shall be independent of any water column connections. Fill connections to all boilers, steam, hot water heating and chilled water or other liquid systems shall be provided at least with a check valve and a stop valve. Where a system is filled with an anti-freeze or toxic solution a permanent tag shall be placed in plain view stating "Caution, this system contains anti-freeze/toxic solution. There shall be no permanent direct connection between this system and the potable water supply of the building".

The administrative authority may require the installation of an air gap or an approved, double check-double gate valve assemblies with test cocks as protective devices against back flow in connections between a potable water system and other fluid systems which present significant health hazards. The use of automatic fill and pressure reducing valves on closed or pressure heating or cooling liquid systems is prohibited. However, permission may be obtained from the administrative authority in isolated cases where hardship can be proven.

SBC 7623 Boiler Foundations. Each steam or hot water boiler to be installed shall be set level, firm, permanent and in a manner which will prevent water from accumulating at the base; subject to the approval of the administrative authority.

(1) Boilers to be installed at other elevations than a basement floor shall rest upon concrete, or other fire proof floor construction having no wooden or other combustible finish in close proximity, except those rated for combustion floor installation.

(2) In boiler replacements where floor is not level, or poor quality, or if water may be encountered on floor around boiler base, a concrete base shall be provided in accordance with the weight of the boiler.

(3) In no case shall a boiler be set where the building is not structurally capable of supporting its operating weight.

SBC 7624 Insulation of Pipes. Where steam and hot water supply and return piping pass through occupied areas where their heat emission might be hazardous or where such piping is likely to freeze, it shall be properly covered with not less than ¾ inch insulation material.

(1) No concealed hot water, steam, or return risers, or branches shall be located in outside walls or exposed portion of any projection of a building unless properly protected with not less than ¾ inch of approved inorganic non-combustible insulation, or unless space around pipes is properly filled with mineral wool or other approved or equal inorganic non-combustible insulating material.

(2) All distribution piping or fittings for chilled water systems shall be covered continuous throughout with a vapor or moisture proof insulation material to prevent condensation.

SBC 7625 Hole Cutting. Because of the variables in hole cutting in building joist members, Appendix I is offered as a guide to the installer of piping systems. Further information related to the minimum standards for hole cutting should be requested of administrative authority.

SBC 7626 Drainage. All systems should be arranged within practical limitations so that the entire system can be evacuated, or the liquid removed by other practical means to permit alterations or repairs, or to prevent possible freeze up due to a malfunction of the system. A floor drain should be provided for all boiler and heat exchanger installations.

SBC 7627 STEAM SYSTEMS. Scope. This section shall include and govern all work done and materials used in the installation of low pressure boilers and/or steam piping systems together with their alteration. For high pressure systems the Minnesota regulations for the installation of high pressure steam piping and appurtenances shall govern.

SBC 7628 Classifications. Steam heating systems shall be classified according to any one of, or combination of, the following features:

(1) Piping arrangement.

(2) Pressure or vacuum conditions.

(3) Method of returning condensate to boiler.

SBC 7629 Definitions. The following terms are defined as follows:

GRAVITY LOW PRESSURE STEAM HEATING SYSTEM. One in which the condensate is returned to the boiler by gravity due to the static head of water in the return mains. The elevation of the boiler water line must consequently be sufficiently below the lowest heating units and steam main and dry return mains to permit the return of condensate by gravity. The water line difference must be sufficient to overcome the maximum pressure drop in the system and the operating pressure of the boiler when radiator and drip traps are used as in two-pipe vapor systems. This applies only to closed circuit systems, where the condensation is returned to the boiler. If the condensation is wasted, no water line difference is required.

MECHANICAL RETURN LOW PRESSURE STEAM HEATING SYSTEM. One in which the condensate flows to a receiver and is then forced into the boiler against the boiler pressure. The lowest parts of the supply side of the system must be kept sufficiently above the water line of the receiver to insure adequate drainage of water from the system, but the relative elevation of the boiler water line is unimportant in such cases except that the discharge head on the mechanical return device becomes greater as the height of the boiler water line above the pump increases.

There are three general types of mechanical returns in common use, namely; (1) the mechanical return trap, (2) the condensation return pump, and (3) the vacuum return pump.

HARTFORD CONNECTION. A method of connecting pipe and pipe fittings in the bleeder or equalizer line between the steam and return headers of a boiler. The connection into the bleeder or equalizer line is made at a height which prevents the boiler water level from lowering dangerously below the normal level as a result of backward flow into the return mains.

Essentially, the Hartford connection is an inverted seal in which one or more returns are brought together below the water line, carried up and tied into the balance equalizing pipe from the header at a point just below the water line. The center line of the shoulder nipple is located at a point two (2) to four (4) inches below the normal water line, depending upon the size of the return main or return header.

DRIP. A pipe (or a steam trap and a pipe considered as a unit) which conducts condensation from the supply side to the return side of a steam heating system.

SERVICE MAINS.

(1) Supply service mains are those pipes through which the steam flows from the boiler or pressure reducing valve and to which the radiator supply branches are connected.

(2) Return Service Mains are those pipes which carry condensate to the boiler or mechanical return device, and to which the radiator return branches are connected.

DOWN-FEED OR OVERHEAD SYSTEMS. Those in which supply mains are above the level of the radiation which they serve.

UP-FEED SYSTEMS. Those in which the supply mains are below the level of the radiation which they serve.

ONE-PIPE SYSTEMS. Those in which the flow of the steam supply to the radiation and the return of condensation flow are in opposition to each other.

TWO-PIPE SYSTEMS. Those in which one pipe is used for the supply of steam to the radiator and another for the return of condensation.

DRY RETURNS. Those returns through which both water and air are being passed.

WET RETURNS. Those returns through which water only is being passed.

VACUUM RETURNS. Those returns through which both water and air are being passed and upon which a vacuum is maintained at all times through the medium of a vacuum producer.

EQUIVALENT LENGTH OF RUN. The actual distance in feet from source of steam supply, boiler or pressure reducing valve, to the farthest radiator in system, and then back along return line to boiler or mechanical return device, plus resistances of all fittings and valves as expressed in terms of straight pipe.

TRANSMISSION MAINS. Those pipes which, though not actually a part of the heating system proper, are connected to the service mains of the system and act as sources of supply to same.

LOW PRESSURE STEAM. Steam at pressures not in excess of 15 pounds above atmospheric pressure.

SBC 7630 Boilers

(1) See Section SBC 7603.

(2) In the determination of boiler capacity to be installed in boiler replacements the actual total connected load shall be counted and the BTU heat loss calculated. The greater of these calculations shall be used for boiler capacity to be installed.

NOTE: Due to firing rate and steam capacity of modern boilers in order to prevent early low water shut down because of loss of water in boiler and retension of condensate in system, gravity system boiler replacements, where large mains and risers exist, (3" and over) should be looked at individually

for the possibility of having to convert the system to a mechanical return pump system or sizing the boiler capacity commensurate with piping losses and connected load.

SBC 7631 Steam Supply from High Pressure Boilers

(1) In every case where steam supply for a low pressure heating plant is taken from a high pressure boiler or boilers from which steam may or may not be furnished for other purposes, the capacity of such boiler or boilers shall be adequate to meet the demand to be placed upon them under peak load conditions.

(2) A proper reducing valve or valves capable of maintaining a reduced pressure not to exceed 15 pounds per square inch on the heating system shall be installed between said high pressure boiler or boilers and the heating system.

(3) A steam safety valve set at not to exceed 15 pounds per square inch shall be installed and vented to the atmosphere on the low pressure side, and discharged at a point that will not jeopardize persons or property.

(4) The safety valve and discharge piping shall be of sufficient capacity and shall be set to relieve the entire output in the event of failure of the pressure reducing valve or valves.

(5) A pressure gauge calibrated to 1½ times the maximum low pressure shall be installed on the low pressure side immediately adjacent to the reducing station.

SBC 7632 Boiler Connections. Steam boiler outlets or inlets shall not be bushed. Steam boilers with multiple outlets shall have not less than two outlets connected to a header or service main, or connected in accordance with the boiler manufacturer's recommendation.

(1) For steam boiler installations the header shall be sized in accordance with the system pressure drop and the gross rating of the boiler or boilers.

(2) In standby boiler installations the header shall be sized in accordance with the capacity of a single boiler.

(3) All steam boilers used in connection with systems having gravity returns shall be provided with a Hartford return connection. In no case will the bottom of the return connection to the equalizer pipe be lower than the safe low water level of the boiler. A scale pocket not less than 1 inch in size shall be provided at the bottom of the return loop connection.

(4) The size of the equalizer pipe is based upon the grate area for hand fired boilers as follows: 1½ inch for boilers having a grate area of less than 4 square feet, 2½ inches for boilers having a grate area of from 4 to 14.9 square feet, or 4 inches for boilers having a grate area of from 15 square feet and over.

(5) The size of the equalizer pipe is based upon the boiler gross output for automatically fired boilers as follows: 1½ inch for boilers with a gross output of 250 pounds per hour or less, 2½ inch for boilers with a gross output of from 251 to 2000 pounds per hour, or 4 inch for boilers with a gross output of more than 2000 pounds per hour.

(6) Each steam boiler shall have a blow-off pipe connection fitted with a steam service type valve or cock not less than ¾ inch pipe size connected with the lowest water space practicable or not less than size of tapping provided by boiler manufacturer for this purpose, or in accordance with the following capacities: 500 pounds per hour, ¾ inch; 501 to 1250 pounds per hour, 1 inch; 1250 to 2500 pounds per hour, 1¼ inch; 2501 to 6000 pounds per hour, 1½ inch; 6000 pounds per hour and larger, 2 inch.

(7) Each steam boiler shall have a steam gage connected to its steam chamber or water column by means of a siphon or equivalent device. The dial shall be calibrated to 1½ to 2 times the safety valve setting.

SBC 7633 Boiler Feed Pumps, Vacuum Pumps and Combinations

(1) Standards. The following sections shall govern the capacities and manner of installation of all boiler feed pumps, vacuum pumps and combinations thereof, traps, etc., installed after the adoption of this code in connection with steam heating plants.

(2) Capacities. In all cases where the boiler feed pumps or vacuum pumps, or any combinations of such devices, or traps, etc., are used in connection with steam heating plants, the capacity of each device or combination of devices shall be subject to the approval of the administrative authority, based upon certified ratings of the manufacturers.

(3) All pumps and equipment shall be set on substantial foundations and secured in such manner as will prevent distortion of adjacent equipment or piping. Flexible couplings shall not be used to compensate for misalignment but only to compensate for temperature variations. Pipe connections shall be independently supported in such a manner as to prevent undue stresses in/on equipment, due either to weight or expansion.

(4) Where there is a likelihood that oil will be absorbed by condensate. Such condensate shall be taken through an effective oil separator before entering any part of the heating system or other apparatus.

SBC 7634 Stop Valves and Check Valves. Where a manual shut-off valve is installed on the steam supply side of any boiler, branch line or heating equipment, a corresponding return shut-off valve or check valve shall be installed on the return side of each.

(1) Multiple Boiler Installation. A shut off valve shall be used in each supply and return pipe connection of two or more boilers connected to a common system.

SBC 7635 Strainers and Drip Pockets. A dirt pocket or strainer shall be installed and so located as to protect steam traps from scale and sludge which will interfere with their operation.

SBC 7636 Drips. All points at which accumulation of water or condensation are liable to occur in steam supply pipes shall be properly dripped and trapped for the removal of condensate.

(1) No steam main shall be dripped into a dry return which carries condensate without trapping such a drip. Whenever it becomes necessary to install traps to discharge the condensate into a return main located above the elevation of the trap, or when the trap must discharge against a definite

back pressure, a check valve shall be installed on the discharge side of the trap.

(2) The dripping of high pressure mains, or of equipment using high pressure steam into low pressure or vacuum return shall be accomplished by the use of a flash tank device or method approved by the administrative authority.

SBC 7637 Radiator Connections. In two-pipe systems, the return connection for each radiator more than 8 sections in length shall be made at the bottom of the radiator by means of either an eccentric bushing turned down or a water-leg section and the supply connection shall be made at the opposite end of the radiator either at top or bottom. In every case, connection to each radiator of a one-pipe system shall be made at the bottom by means of either an eccentric bushing turned down or a water-leg section.

SBC 7638 HOT WATER HEATING, CHILLED WATER COOLING AND LIQUID PIPING SYSTEMS. Scope. This section shall include and govern all work done and materials used in the installation of hot water heating boilers and systems of piping hot water, chilled water or other liquids.

SBC 7639 Classifications. Liquid systems shall be classified according to operating temperature as follows:

(1) Low-Temperature Liquid Systems. A hot liquid heating system operating within the pressure and temperature limits of the ASME Boiler Construction Code for Low Pressure Heating Boilers. The maximum allowable temperature is 250° F.

(2) Medium-Temperature Liquid Systems. A hot liquid heating system operating at temperatures of 250°-350° F.

(3) High-Temperature Liquid Systems. A hot liquid heating system operating at temperatures over 350° F.

(4) Medium and high-temperature liquid systems are basically similar to conventional (LTW) forced hot water systems. The principal differences from low-temperature water systems are the higher pressure, the heavier equipment, the smaller pipe sizes, and the manner in which pressure is maintained on the liquid. (Reference: ASHRAE Guide and Data Book, "Applications", Chapters 10, 11 and 12).

SBC 7640 Definitions. The following terms shall mean:

GRAVITY HOT WATER SYSTEMS. Gravity Hot water heating systems where circulation of water is due to the head created by the difference in density of the water between the supply and return risers.

FORCED HOT WATER SYSTEM. Forced hot water system in which circulation is created by means of a pump, usually driven by an electric motor.

CLOSED HOT WATER SYSTEM. A forced hot water system in which the circulating water is completely enclosed, under pressure above atmospheric, and closed to the atmosphere.

EXPANSION TANK, CLOSED SYSTEM. An airtight tank which provides a means of pressurizing the system over a wide range of conditions.

SERIES LOOP, ONE PIPE SYSTEM. A system in which the heated water flows through each consecutive heating element and directly back to the source.

ONE PIPE SYSTEM. A one pipe system employs a single pipe main with special fittings installed at riser connections to the heating elements.

TWO PIPE REVERSED RETURNED SYSTEM. A system in which the heating medium from each heat transfer unit is returned along paths arranged so that all circuits composing the system are of equal length.

TWO PIPE DIRECT RETURN SYSTEM. A system in which the heating medium after it has passed through a heat exchanger unit, is returned to the boiler by the shortest direct path, resulting in considerable differences in the lengths of the several circuits composing the system.

PURGE SYSTEM. A system whereby the initial removal of air is accomplished from piping systems by directing the flow of water with sufficient velocity.

PURGE VALVE. A valve installed between the fill water pipe connection and the purge drain connection.

PURGE DRAIN VALVE. A valve providing a hose connection at a purge point for initial removal of air.

SBC 7641 Boilers

(1) See SBC 7603.

(2) Table 3 sets forth factors to be used in determining net load ratings of boilers based on input. These factors when multiplied by the BTU input to the boiler will give the net rating of the hot water boiler in BTU or square feet of equivalent direct radiation.

TABLE No. 3

HOT WATER BOILERS

Input BTU	A Output BTU	B* Output New Forced Circulation Installation*
1570 M—Under	.60	.70
2470 M—Under	.61	.71
over 2470	.62	.72

*These modern allowances are to be applied to modern continuous circulation installations only.

SBC 7642 General System Design. The water velocity and water temperature drops for all terminal heating and cooling units and piping thereto shall fall within the manufacturers published ratings for those units and piping.

SBC 7643 Expansion or Compression Tanks

(1) Every hot water heating system shall be provided with a compression or expansion tank of a capacity as set forth in Table 2 or formula below.

This formula should be used only for operating temperatures between 106 degrees F. and 280 degrees F.

$$V_t=\frac{(0.00041_t-0.0466)V_s}{\frac{P_a}{P_f}-\frac{P_a}{P_o}}$$

Where

V_t=minimum volume of the expansion tank, gallons.

V_s=system volume, gallons.

$_t$=maximum average operating temperature, Fahrenheit.

P_a=pressure in expansion tank when water first enters usually atmosphere pressure, feet of water, absolute.

P_f=initial fill or minimum pressure at tank, feet of water absolute.

P_o=maximum operating pressure at tank, feet of water, absolute.

A widely used formula recommended for temperatures below 160 degrees F. is:

$$V_t=\frac{E}{\frac{P_a}{P_f}-\frac{P_a}{P_o}}$$

Where

E=net expansion of the water in the system when heated from minimum temperatures to maximum temperatures, gallons.

(2) Provision shall be made for draining such tank without emptying system.

(3) The valve between the boiler or mains and the expansion tank shall have permanently attached thereto a metal tag having substantially the following wording stamped or etched thereon: "This valve must be OPEN at all times except when draining expansion tank."

(4) The tank shall be securely and adequately supported in such manner that no portion of the weight of the tank or contents will be borne by the piping connected thereto, and shall be provided with drain connection and valve. No attachment into bottoms of wood joists by nails is permitted.

(5) The minimum pipe size to connect an expansion tank to the system shall be ½ inch I.D. for closed systems and ¾ inch I.D. for open systems.

SBC 7644 Residential System Design. System design features and the sizing of hot water and chilled water pipe distribution systems shall be consistent with the practices presented in the ASHRAE guide copies of which are on file with the administrative authority.

Design Limitations.

(1) Average water temperatures in living areas for hot water space heating shall not exceed 200 degrees for residential applications.

(2) Maximum water velocities in hot water or chilled water systems shall not exceed those listed in Table 1.

(3) Where design temperature drops in excess of 20° are to be used, calculations shall be submitted to the administrative authority.

SBC 7645 TABLE No. 1 (RESIDENTIAL)

Pipe Diameter (inches)	½ to 1½	2	2½	3	4	5	6
Maximum Velocity (feet per second)	4	4.5	5	6	7	8.5	10

SBC 7646 Pitch and Venting. All piping shall be installed so that all gases which are liberated from the water can move freely to a vented section of the system. Whenever practicable, the pipe line shall be pitched so that gases flowing to a vent will flow in the same direction as the water. A positive means of eliminating gases and air from the system shall be provided. A purge system may be used provided that individual circuits can be individually purged.

SBC 7647 Chilled Water Piping General. All distribution piping and fittings for chill water systems are to be covered continuously throughout with a vapor or moisture proof insulation material.

(1) In combination heating and cooling systems using a single pump, a balance cock shall be installed in the supply pipe from the heating source.

(2) Air vents shall be provided at all fan coil units and at all high points in the system.

(3) Units which are to be used only for heating shall be provided with a shut-off valve, to be closed when cooling system is in operation.

(4) Condensate drains from terminal units shall not be connected directly to building plumbing systems.

(5) The piping cross-connection between chiller and heating source shall be provided with a means of isolation to prevent the circulation of heater water through chiller or chilled water through the heating source.

(6) Each relief valve shall be placed on the chilling source side of all valves. Each valve shall be set to relieve at a pressure not to exceed the lowest maximum working pressure rating of any system component.

SBC 7648 Air Cushion Tank. Due to the slight expansion in the volume of water in cooling systems, the required air cushion tank capacity in gallons for a system designed for cooling can be determined by dividing the total Btu/hr cooling load by 50,000. Method in SBC 7643 also applies.

(1) Whenever valves are installed in the piping to the air cushion tank, they shall be tagged in accordance with SBC 7643.

(2) Combination heating and cooling systems may be provided with separate air cushion tanks for the chiller and boiler.

TABLE NO. 4—METHOD FOR

Maximum Tank Size Required For Boiler (Under Standard Conditions)*					Maximum Tank Size Required For Radiation (Under Standard Conditions)*						
	Conventional		Flash			Large Tube		Thin Tube		Convector	
Net Btu Rating in 1000 Btuh	Gals. in Boiler	Tank Req'd	Gals. in Boiler	Tank Req'd	Rad. Output in 1000 Btuh at 200 Btuh Emission	Gals. in Rad.	Tank Req'd	Gals. in Rad.	Tank Req'd	Gals. in Rad.	Tank Req'd
50	12	2.64	5.4	1.19	50	28.5	6.27	15.7	3.4	7	1.5
60	14.5	3.19	6.4	1.41	60	34.2	7.52	16.8	3.7	7.5	1.65
70	17	3.74	7.2	1.57	70	40	8.8	19.6	4.3	8.7	1.93
80	19.5	4.29	8.0	1.75	80	45.6	10	22.4	4.9	10	2.2
90	22	4.9	8.6	1.89	90	51.4	11.3	25.2	5.5	11.25	2.48
100	25	5.5	9.4	2.07	100	57	12.5	28	6.2	12.5	2.75
125	30	6.6	11	2.42	125	71	15.6	39	8.58	17.7	3.89
150	36	7.9	13	2.86	150	85.5	18.8	47.8	10.5	21	4.62
175	42	9.24	14.5	3.19	175	99	21.7	55	12.1	24.7	5.43
200	48	10.6	16	3.52	200	114	25.8	63.8	14.1	28.5	6.27
250	60	13.1			250	142	31.2	79.8	17.5	35.6	7.83
300	70	15.4			300	171	37.6	95.7	21.0	42.7	9.39
350	84	18.4			350	199	43.7	111	24.4	49.7	10.9
400	95	20.9			400	228	50.1	127	27.9	57	12.5
450	107	23.5			450	256	56.1	143	31.4	64	14
500	120	26.4			500	285	62.7	157	34.5	71	15.6
600	140	30.8			600	342	75.2	191	42	85.5	18.8
700	160	35.2			700	399	87.7	223	49	98.7	21.7
800	190	41.8			800	456	100	251	55.2	114	25
900	210	46			900	513	112	287	63.1	128	28.1
1000	235	51.7			1000	570	125	319	70.1	142	31.2
2000	480	106			2000	1140	250	638	140	285	62.7
3000	720	158			3000	1710	376	957	210	427	93.9
4000	960	211			4000	2280	501	1276	280	560	123
8000	1200	264			8000	4560	1003	2553	561	1140	250
12000	3000	660			12000	6840	1504	3830	832	1710	376
16000	3700	814			16000	9120	2006	5107	1123	2280	501
					20000	11400	2508	6384	1407	2850	627

Correction Factors For Initial Pressures Other Than 12 Psig (4 Psig Min. Pressure Highest Part of System, 30 Psig Relief Pressure					Correction Factors For Attic Tanks (4 Psig Initial Pressure on Tank Press., Rise = Final Press.-Static-4 Psig)			
Initial Pressure	Static Height	Max. Mean Temp. at Max. Mult. Factor	Multiplying Factor Maximum	Multiplying Factor Minimum	Pressure Rise	Max. Mean Temp. at Max. Mult. Factor	Multiplying Factor Maximum	Multiplying Factor Minimum
4	0	264	0.465	0.3	4	222	1.27	1.25
6	4.5	260	0.575	0.38	8	235	0.77	0.68
8	9	257	0.7	0.48	10	238	0.68	0.57
10	14	258	0.83	0.59	12	242	0.63	0.50
12	18.5	252	1.0	0.73	14	246	0.59	0.45
14	23	250	1.10	0.9	16	249	0.55	0.41
16	27.5	245	1.43	1.1	18	252	0.53	0.38
18	32	242	1.74	1.41	20	255	0.51	0.36
20	36.5	237	2.18	1.82	25	261	0.48	0.315
22	41.5	235	2.82	2.5	30	267	0.465	0.28
24	46	227	3.82	3.5	35	271	0.45	0.26

Standard conditions are: 12 psig initial pressure, 30 psig final pressure, static pressure up to 18.5 ft.

SELECTING EXPANSION TANKS

Maximum Tank Size Required For Radiation (Under Standard Conditions)*				Maximum Tank Size Required For Forced Circulation Piping (Under Standard Conditions)*					Maximum Tank Size Req'd. For Panel (Under St'd. Conditions)*		
Cast Iron Base Board		Convector Base Board		Heat Conveyed in 1000 Btuh	One Pipe		Two Pipe		System Btu in 1000 Btuh	Panel Gals. in Panel Piping	Tank Req'd.
Gals. in Rad.	Tank Req'd.	Gals. in Rad.	Tank Req'd.		Gals. in Piping	Tank Req'd.	Gals. in Piping	Tank Req'd.			
23.5	5.16	3.2	0.704	50	7.8	1.7	10.5	2.3	50	11	0.8
28.3	6.25	4.0	0.880	60	9.0	1.98	12.5	2.75	60	13.5	1.0
33	7.25	4.5	0.990	70	10.0	2.2	14.5	3.2	70	16	1.2
37.8	8.3	5.2	1.14	80	11.5	2.5	17	3.7	80	18.5	1.35
42.5	9.4	5.8	1.27	90	13	2.9	18	3.96	90	21	1.55
47.1	10.4	6.5	1.43	100	14	3.1	21	4.6	100	24	1.75
58.8	13	8.1	1.78	125	18	3.96	27	5.9	125	30	2.2
70.8	15.6	9.7	2.13	150	22	4.85	34	7.5	150	37	2.7
82.8	18.2	11.3	2.43	175	26	5.7	40	8.8	175	44	3.2
94.3	20.8	13	2.86	200	30	6.6	47	10.3	200	50	3.7
117.8	28	16.2	3.56	250	39	8.6	62	13.6	250	65	4.75
141.5	31	19.5	4.29	300	49	10.8	78	17.2	300	70	5.7
165	36.2	22.7	4.99	350	58	12.8	94	20.7			
188.5	41.5	26	5.72	400	70	15.4	110	24.2			
212	46.6	29.2	6.42	450	80	17.6	130	28.6			
235.8	52	32.5	7.15	500	90	19.8	150	33			
202.8	62	39	8.58	600	115	25.3	190	41.8			
330	72.5	45.5	10	700	140	30.8	225	49.5			
377	83	52	11.4	800	165	36.3	260	57.2			
424.3	93	58.5	12.8	900	195	42.9	310	68.2			
476.5	105	65	14.3	1000	225	49.5	360	79.2			
942	208	130	28.6	2000	540	119	900	198			
1414	311	195	42.5	3000	960	211	1500	330			
1885	415	260	57.2	4000	1350	297	2100	462			
3770	830	520	114	8000	3400	748	5000	1100			
3655	1250	780	171	12000	5000	1254	9000	1980			
7542	1670	1040	228	16000	8300	1826	13000	2860			
9427	2080	1300	286								

Note:
For minimum tank size under standard conditions multiply Value obtained from table by 0.73

Correction Factors For Systems Using Compressor to Charge Tank (Comp. Tank 80% Full of Air After Charging with Compressor)						Correction Factors For Safety Loop Systems				Correction Factors For Tanks that are Already Undersize	
Static Height	Initial Pressure	Relief Pressure	Max. Mean Temp. at Max. Mult. Factor	Multiplying Factor Maximum	Multiplying Factor Minimum	Initial Pressure	Max. Mean Temp. at Max. Mult. Factor	Multiplying Factor Maximum	Multiplying Factor Minimum	If Tank Reaches Final Press. At Temp.	Req'd. Tank Size Increase For Final Press. at 220F.
10	8.5	30	256	0.53	0.35	4	262	0.72			orig-
18.5	12	30	252	0.65	0.48	6	262	0.98	0.56		inal
25	15	30	248	0.85	0.67	8	262	1.24	0.74		tank
30	17	30	244	0.97	0.79	10	262	2.16	1.0	170 2.1 x	vol.
40	21.5	45	255	0.71	0.47	12	262	3.5	1.5	180 1.87 x	"
50	26	45	251	0.815	0.59					190 1.63 x	"
60	30	45	248	1.04	0.82					200 1.34 x	"
75	37	75	264	0.68	0.78					210 1.24 x	"
100	47	75	264	0.97	0.62					220 1.13 x	"
150	65	100									

SBC 7649 SNOW MELTING. Scope. This part of the code shall include and govern the work done and materials used in the installation of steam and circulating hot fluid snow melting systems, and the alteration, repairs and extensions to such installations.

SBC 7650 System Design. The thermal design and installation of snow melting systems shall be consistent with the practices presented in the ASHRAE Guide, copies of which are on file in the Department of Administration.

SBC 7651 Safety. Snow melting systems shall be installed and maintained independently.

There shall be no permanent connection between the snow melting system and the drinking water supply. (See Section SBC 7622).

Where petroleum distillates are used for fluids, caution or barriers to prevent possible oil leakage from being ignited shall be provided.

SBC 7652 Corrosion. Ethylene glycol solution should be tested annually to determine any change in acidity. If test indicates the inhibitor has been exhausted, the entire system should be drained and a fresh solution installed.

SBC 7653 Tag. A permanent tag shall be attached to or near the fill connection of the system stating what type of solution is present and the degree of protection that solution will provide.

SBC 7654 Thermal Stresses. Design of these systems shall be limited to an average water temperature not to exceed 120 degrees F. for piping installed in concrete.

Piping required to pass through a concrete expansion joint shall be provided with an expansion loop of sufficient length, to protect the piping from stress under normal conditions, extending underground and covered with a water proof vapor barrier and thermal insulation.

SBC 7655 Testing. Testing piping before pouring of concrete shall be as outlined in SBC 7650 with the exception of where petroleum distillates are to be used for anti-freeze fluid the test will be by air.

SBC 7656 Draining and Venting. Pipes shall be installed, so that they may be drained and the air completely vented during filling.

SBC 7657 Steam Systems. Steam snow melting systems shall have their piping encased in a non-corrosive type conduit and installed in accordance with the provisions of this code as related to steam systems.

SBC 7658 Joints. All joints in piping shall be fusion welded or capillary brazed using appropriate fittings.

SBC 7659 Freeze Protection. Fluids for snow melting systems shall be capable of withstanding —30 degrees F.

SBC 7660 Expansion Tank. The expansion tank shall be sized in accordance with SBC 7643 plus an additional factor depending on type of antifreeze.

SBC 7661 Thermal Shock. To prevent shock, where large load variations and volumes of water are pumped through boilers, precautions must be taken to prevent a supply return temperature difference exceeding 30 degrees F.

NOTE: Annex I shall be considered as binding and enforceable. Appendices I, II and III are provided as guides. The materials listed in Annex I are permitted (within their limitations) subject to restrictions found elsewhere in this code.

ANNEX I

APPROVED MATERIALS

Ferrous

1. Cast Iron Threaded Fittings (125 to 250 pound) ANSI (B16.4)
2. Steel Pipe, Welded and Seamless, Schedule 40 and Heavier — ANSI (B36.1 and B36.20)
3. Wrought Iron Pipe, Schedule 40 and Heavier — ANSI (B36.2)
4. Stainless Steel Pipe — ANSI (B36.19)
5. Malleable Fittings 150 PSI and Heavier — ANSI (B16.3)
6. Wrought Steel Buttwelding Fittings — ANSI (B16.9)
7. Buttwelding Ends for Pipe, Valves, Flanges and Fittings — ANSI (B16.25)
8. Wrought Steel Buttwelding Short Radius Elbows and Returns — ANSI (B16.28)

Copper Base

1. Red Brass Pipe — ANSI (B27.1)-ASTM (B42 and B43)
2. Seamless Brass Tube — ANSI (B36.1)
3. Brass or Bronze Threaded Fittings, 125 PSI and Heavier — ANSI (B16.15)-ASTM 62.
4. Brass or Bronze Flare Fittings, 125 PSI and Heavier, Heavy Duty Long Collar Type — ASTM (B62)
5. Seamless Copper Tube, Types K and L — ANSI (B231)-ASTM (B88) Soft Temper
6. Seamless Copper Tube, Tubes K, L and M — ANSI (B231)-ASTM (B88) Hard Temper
7. Cast Bronze and Wrought Solder Joint Fittings — ANSI (B16.22, B23.1, B16.18)

Plastic Pipe and Fittings

(Particular care should be taken with regard to temperatures, pressures, and other conditions of use.)

1. ABS Type 1 — ANSI (B72.3)-ASTM D2282
2. Polyethelylene — ANSI (B72.1)-ASTM D2239
3. Polyvinyl Chloride (PVC) — ANSI (B72.2)-ASTM D2241
4. Polybutylene-ASTM D2581

APPENDIX I
(Relating to Chapter 76 of the Code)

Radiation in square feet for any unenclosed radiator shall be defined as the minimum guaranteed heat emission of that radiator measure in BTU per hour divided by 240 for Direct Steam and 150 for Direct Hot Water Radiation.

(1) Table for other temperatures. For various other water (or steam) temperatures, various emissions per square foot are shown in the following table:

TABLE No. 1

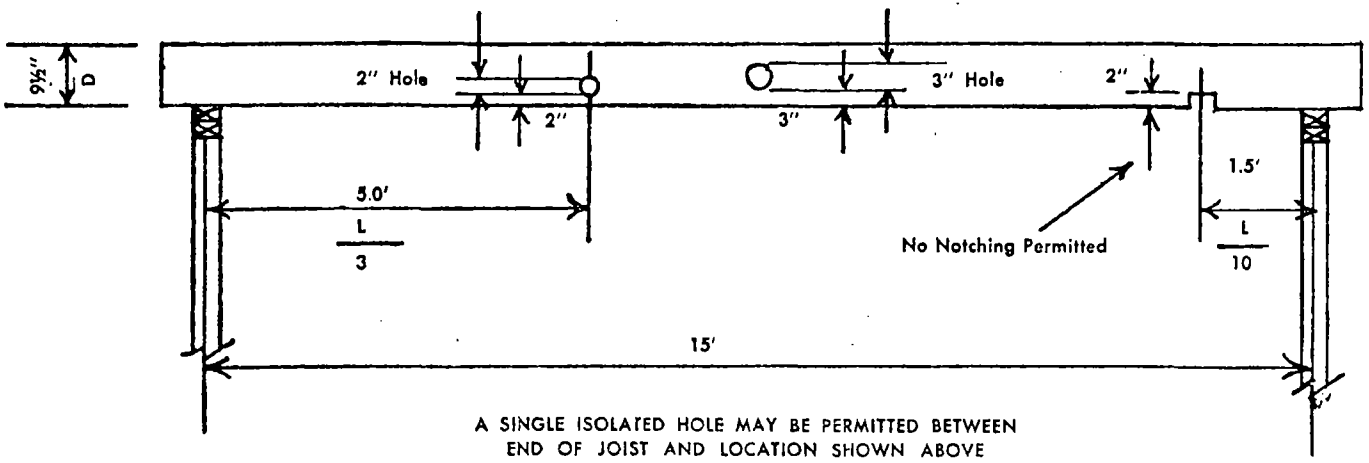
Average Temperature of Water in Radiator	Heat Emission Per Square Foot
150	110 BTU per hour
160	130 BTU per hour
170	150 BTU per hour
180	170 BTU per hour
190	190 BTU per hour
200	210 BTU per hour
215	240 BTU per hour
225	260 BTU per hour
240	295 BTU per hour

NOTE 1: The above emissions are for a radiator in air at 70 degrees F.

NOTE 2: Enclosed radiators, convectors or concealed heater emission ratings shall be determined as set forth in the American Society of Heating and Ventilating Engineers Guide.

LENGTH IN FEET OF PIPE TO BE ADDED TO THE ACTUAL LENGTH OF RUN OWING TO FITTINGS—TO OBTAIN EQUIVALENT LENGTH

	Length in Feet to be Added to Run				
Size of Pipe Inches	Standard Elbow	Side Outlet Tee	Gate Valve	Globe Valve	Angle Valve
½	1.3	3	0.3	14	7
¾	1.8	4	0.4	18	10
1	2.2	5	0.5	23	12
1¼	3.0	6	0.6	29	15
1½	3.5	7	0.8	34	18
2	4.3	8	1.0	46	22
2½	5.0	11	1.1	54	27
3	6.5	13	1.4	66	34
3½	8	15	1.6	80	40
4	9	18	1.9	92	45
5	11	22	2.2	112	56
6	13	27	2.8	136	67
8	17	35	3.7	180	92
10	21	45	4.6	230	112
12	27	53	5.5	270	132
14	30	63	6.4	310	152



Maximum size of hole in center section of joist: $\frac{\text{Width of joist}}{3}$ And on center axis of joist. One hole only of the above size permitted in center section.

Maximum size of hole in end sections of joists:

Maximum size hole=2"

Minimum distance from bottom of joist=2"

Minimum space between holes in end section area=6"

THERMAL EXPANSION OF PIPE IN INCHES PER 100 FEET (a)

Saturated Steam		Elongation in Inches per 100 ft. from —20P up			
Pressure Psig	Temp. Degrees F.	Cast Iron Pipe	Steel Pipe	Wrought Iron Pipe	Copper Pipe
—	—20	0	0	0	0
0.0	212	1.575	1.785	1.866	2.608
2.5	220	1.634	1.852	1.936	2.720
10.3	240	1.780	2.020	2.110	2.960
20.7	260	1.931	2.183	2.279	3.189
34.5	280	2.083	2.350	2.465	3.422
52.3	300	2.233	2.519	2.630	3.665

(a) To obtain the amount of expansion between any two temperatures, take the difference between the figures in the table for those temperatures.

APPENDIX II
(Relating to Section SBC 7627 of the Code)

Steam Systems (Low Pressure)

Design Pressure Drops

(1) The total pressure drop shall not exceed one-half of the initial pressure when condensate is flowing in the same direction of the steam.

(2) Where condensate must flow counter to the steam, the governing factor is the velocity permissible without interfering with the condensate flow. Table 2 gives the allowable velocities for given capacities for horizontal pipe at various grades.

TABLE No. 1—PRESSURE DROPS IN COMMON USE FOR SIZING STEAM PIPE (a)
(FOR CORRESPONDING INITIAL STEAM PRESSURE)

Initial Steam Pressure, Psig	Pressure Drop Per 100 Ft., Psi.	Total Pressure Drop in Steam Supply Piping, Psi.
Sub-atmospheric or vacuum return	2-4 oz.	1-2 psi.
0	½ oz.	1 oz.
1	2 oz.	1-4 oz.
2	2 oz.	8 oz.
5	4 oz.	1½ psi.
10	8 oz.	3 psi.
15	1 psi.	4 psi.
30	2 psi.	5-10 psi.
50	2-5 psi.	10-15 psi.
100	2-5 psi.	15-25 psi.
150	2-10 psi.	25-30 psi.

Maximum Velocity

(1) Where the quantity of the condensate is limited, and is flowing the same direction as the stream, the velocity shall be in accordance with the presure drop as shown in Table I, preceding.

(2) When the condensate must flow against the stream, even in limited quantity, the velocity of the stream shall not exceed the velocities for given capacities as shown in Table 2, preceding.

Equivalent Length of Run

(1) The size of pipe required for the flow of steam must allow for the friction offered by the pipe, as well as for the additional resistance of the fittings and valves.

(2) The length of run can be assumed to be double the actual length of pipe. This assumption shall be checked after the pipes are sized.

(3) The resistances of the fittings and valves are stated in terms of straight pipe. Table 3 gives the number of feet of straight pipe that shall be allowed for the fittings and valves. See Appendix I.

TABLE No. 2—COMPARATIVE CAPACITY OF STEAM LINES AT VARIOUS PITCHES FOR STEAM AND CONDENSATE FLOWING IN OPPOSITE DIRECTIONS. (a)

(Pitch of Pipe in Inches per 100 Ft. Velocity in Ft. per Sec.)

Pitch of Pipe	¼ in.		½ in.		1 in.		1½ in.		2 in.		3 in.		4 in.		5 in.	
	Capacity Expressed in Pounds per Hour															
Pipe Size Inches	Capacity	Max. Vel.	Capacity	Max. Vel.	Capacity	Max. Vel.	Capacity	Max. Vel.	Capacity	Max. Vel.	Capacity	Max. Vel.	Capacity	Max. Vel.	Capacity	Max. Vel.
¾	6.3	12	7.6	14	9.3	18	10.1	19	10.6	20	11.5	21	11.9	22	12.3	23
1	11.5	12	13.2	15	15.8	17	17.5	20	18.8	22	20.8	23	22.0	25	22.6	26
1¼	26.2	15	29.3	20	33.3	23	36.1	25	38.5	27	41.3	28	43.2	29	44.6	31
1½	35.7	18	39.8	21	45.3	23	49.1	25	52.3	27	56.0	28	58.7	30	60.7	31
2	59.0	19	65.9	20	74.9	23	81.4	25	86.6	27	92.4	28	97.1	29	100.3	30

(a) From A.S. of M, R and A.C. Engineers Research Laboratory.

Tables for Pipe Sizing Low Pressure Steam Systems. The values in Tables 4, 5, and 6 shall be used in selecting pipe sizes for the various pressure drops for low pressure steam systems.

Sizing Piping for One-Pipe Gravity Air Vent Systems. One-pipe gravity air vent systems, in which the equivalent length of run does not exceed 200 ft., shall be sized up by means of Tables 4, 5, and 6.

(1) For the steam main and dripped run-outs to risers where the steam and condensate flow in the same direction, use ⅛ psig. drop Column D.

(2) Where the riser run-outs are not dripped and the steam and condensate flow in opposite directions, and also for the radiator run-outs where the condition occurs, use Column L.

(3) For up-feed steam risers carrying condensate back from the radiators, use Column J.

(4) For down-feed systems, the main risers of which do not carry any radiator condensate, use Column H.

(5) For the radiator valve size and stub connection, use Column K.

(6) For the dry-return main, use Column U.

(7) For the wet-return main, use Column T.

(8) For systems exceeding an equivalent length of 200 ft., the total drop shall not exceed ¼ psi. The return piping sizes shall correspond with the drop used on the steam side of the system. Thus, where ¼ psi. drop is being used, the steam main and dripped run-outs shall be sized from Column C; radiator run-outs and undripped riser run-outs from Column L; up-feed risers from Column J; the main riser on a down-feed system from Column C (it will be noted that if Column H is used, the drop would exceed the limit of ¼ psi.); the dry-return from Column R; and the wet-return from Column Q.

(9) With a 1/32 psi. drop, the sizing would be the same as 1/16 psi, except that the steam main and dripped run-outs would be sized from Column B; the main riser on a down-feed system from Column C, and the wet-return from Column N.

(10) Pitch of mains shall not be less than ¼ inch in 10 feet.

(11) Pitch of horizontal run-outs to risers and radiators shall not be less than ½ inch per foot. Where this pitch cannot be obtained, run-outs over 8 feet in length shall be one size larger than called for in the table.

(12) No supply main less than 2 inches in diameter shall be used. The diameter of the far end of the supply main shall not be less than half its diameter at its largest part.

(13) Supply mains, run-outs to risers, or risers, should be dripped where necessary.

(14) Where supply mains are decreased in size, they shall be dripped or provided with eccentric couplings flush on bottom.

TABLE NO. 4—STEAM PIPE CAPACITIES FOR LOW PRESSURE SYSTEMS
(Reference to this table will be by column letter A through L)

This table is based on pipe size data developed through the research investigations of the American Society of Heating and Ventilating Engineers.

	CAPACITIES OF STEAM MAINS AND RISERS								SPECIAL CAPACITIES FOR ONE-PIPE SYSTEMS ONLY		
	Direction of Condensate Flow in Pipe Line										
	With the Steam in One-Pipe and Two-Pipe Systems						Against the Steam Two-Pipe Only				
Pipe Size In.	1/12 psi or ½ oz. Drop	1/24 psi or ¾ oz. Drop	1/16 psi or 1 oz. Drop	⅛ psi or 2 oz. Drop	¼ psi or 4 oz. Drop	½ psi or 8 oz. Drop	Vertical	Horizontal	Supply Risers Upfeed	Radiator Valves and Vertical Connections	Radiator and Riser Runouts
A	B	C	D	E	F	G	H[a]	I[a]	J[b]	K	L[a]
CAPACITY EXPRESSED IN SQUARE FEET E D R											
¾	—	—	30	—	—	—	30	—	25	—	—
1	39	46	56	79	111	157	56	34	45	28	28
1¼	87	100	122	173	245	346	122	75	78	62	62
1½	134	155	190	269	380	538	190	108	152	93	93
2	273	315	386	546	771	1,091	386	195	283	169	169
2½	449	518	635	898	1,270	1,800	635	395	464	—	260
3	822	948	1,160	1,650	2,330	3,290	1,130	700	800	—	475
3½	1,230	1,420	1,740	2,460	3,470	4,910	1,550	1,150	1,140	—	745
4	1,740	2,010	2,460	3,480	4,910	6,950	2,040	1,700	1,520	—	1,110
5	3,210	3,710	4,550	6,430	9,090	12,900	4,200	3,150	—	—	2,180
6	5,280	6,100	7,460	10,550	14,900	21,100	7,200	5,600	—	—	—
8	11,000	12,700	15,500	21,970	31,070	43,900	15,000	12,000	—	—	—
10	20,000	23,100	28,300	40,100	56,700	80,200	28,000	23,000	—	—	—
12	32,000	32,100	45,500	64,300	91,000	129,000	46,000	38,000	—	—	—
16	61,000	69,700	84,800	121,000	170,000	242,000	88,000	76,000	—	—	—

TABLE NO. 4—Continued
CAPACITY EXPRESSED IN POUNDS PER HOUR

Pipe Size In.	CAPACITIES OF STEAM MAINS AND RISERS — Direction of Condensate Flow in Pipe Line — With the Steam in One-Pipe and Two-Pipe Systems: 1/4 psi or 1/2 oz. Drop	1/24 psi or 2/3 oz. Drop	1/8 psi or 1 oz. Drop	1/8 psi or 2 oz. Drop	1/4 psi or 4 oz. Drop	1/2 psi or 8 oz. Drop	Against the Steam Two-Pipe Only: Vertical	Horizontal	SPECIAL CAPACITIES FOR ONE-PIPE SYSTEMS ONLY: Supply Risers Upfeed	Radiator Valves and Vertical Connections	Radiator and Riser Run-outs
A	B	C	D	E	F	G	H[a]	I[a]	J[b]	K	L[c]
CAPACITY EXPRESSED IN SQUARE FEET E D R											
3/4	—	—	8	—	—	—	8	—	6	—	7
1	10	12	14	20	28	40	14	9	11	7	7
1 1/4	22	25	31	43	61	87	31	19	20	16	16
1 1/2	34	39	48	67	95	135	48	27	30	23	23
2	68	79	97	137	193	273	97	49	72	42	42
2 1/2	112	130	159	225	318	449	159	99	116	—	65
3	206	237	291	411	581	822	282	175	200	—	119
3 1/2	307	355	434	614	869	1,230	387	288	286	—	186
4	435	503	614	869	1,230	1,740	511	425	380	—	278
5	806	928	1,140	1,610	2,270	3,210	1,050	788	—	—	545
6	1,320	1,520	1,870	2,640	3,730	5,250	1,800	1,400	—	—	—
8	2,750	3,170	3,880	5,490	7,770	11,000	3,750	3,000	—	—	—
10	5,010	5,750	7,090	10,000	14,200	20,000	7,000	5,700	—	—	—
12	8,040	9,290	11,400	16,100	22,700	32,200	11,500	9,500	—	—	—
16	15,100	17,400	21,200	30,300	42,400	60,500	22,000	19,000	—	—	—
	All Horizontal Mains and Down-Feed Risers						Upfeed Risers	Mains & Undripped Run-outs	Upfeed Risers	Radiator Connections	Run-outs not Dripped

Note: Steam at an average pressure of 1 psig is used as a basis for calculating capacities. All drops shown are in psi per 100 ft. of equivalent run—based on pipe properly reamed.

[a] Do not use Column E for drops of 1/24 or 1/32 psi; substitute Column C or Column B as required.

[b] Do not use Column J for drop 1/32 psi except on sizes 3 in. end over; below 3 in. substitute Column B.

[c] Pitch of horizontal runouts to risers and radiators should be not less than 1/2 in. per ft. Where this pitch cannot be obtained, runouts over 8 ft. in length should be one pipe size larger than called for in Table 5.

TABLE NO. 5—RETURN PIPE CAPACITIES FOR LOW PRESSURE SYSTEMS

Capacity Expressed in Square Feet of Equivalent Direct Radiation
(Reference to this table will be by column letter M through EE)

This table is based on pipe size data developed through the research investigation of the American Society of Heating and Ventilating Engineers.

CAPACITY OF RETURN MAINS AND RISERS

MAINS

Pipe Size Inches	1/17 Psi or 1/2 oz. Drop per 100 ft.			1/24 Psi or 3/4 oz. Drop per 100 ft.			1/8 Psi or 1 oz. Drop per 100 ft.			1/4 Psi or 2 oz. Drop per 100 ft.			1/2 Psi or 4 oz. Drop per 100 ft.			1 Psi or 8 oz. Drop per 100 ft.		
	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.
M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE
¾	—	—	—	—	—	—	—	—	400	—	—	568	—	—	800	—	—	1130
1	500	248	—	580	285	570	700	320	700	1000	412	994	1400	460	1400	—	—	1980
1¼	850	520	—	970	395	976	1200	670	1200	1700	868	1700	2400	962	2400	—	—	3390
1½	1050	822	—	1570	943	1550	1500	1060	1900	2700	1360	2700	3600	1510	3800	—	—	5370
2	2800	1880	—	3240	2140	3260	4000	2300	4000	5600	2960	5680	8000	3300	8000	—	—	11300
2½	4700	3040	—	5300	3470	5450	6700	3800	6700	9400	4900	9510	13400	5450	13400	—	—	18900
3	7500	5840	—	8500	6250	8710	10700	7000	10700	15000	9000	15200	21400	10000	21400	—	—	30200
3½	11000	7880	—	13200	8800	13000	16000	10000	16000	22000	12900	22700	32000	14300	32000	—	—	45200
4	15500	11700	—	18300	13400	18000	22000	15000	22000	31000	19300	31200	44000	21500	44000	—	—	62190
5	—	—	—	—	—	31500	—	—	38700	—	—	54900	—	—	77400	—	—	109000
6	—	—	—	—	—	50450	—	—	62000	—	—	88000	—	—	124000	—	—	175000

RISERS

¾	—	190	—	—	190	570	—	190	700	—	190	994	—	190	1400	—	—	1980
1	—	450	—	—	450	976	—	450	1200	—	450	1700	—	450	2400	—	—	3390
1¼	—	990	—	—	990	1550	—	990	1900	—	990	2700	—	990	3800	—	—	5370
1½	—	1500	—	—	1500	3260	—	1500	4700	—	1500	5680	—	1500	8000	—	—	11300
2	—	3000	—	—	3000	5450	—	3000	6700	—	3000	9510	—	3000	13400	—	—	18900
2½	—	—	—	—	—	8710	—	—	10700	—	—	15200	—	—	21400	—	—	30200
3	—	—	—	—	—	13000	—	—	16000	—	—	22700	—	—	32000	—	—	45200
3½	—	—	—	—	—	17900	—	—	22000	—	—	31200	—	—	44000	—	—	62200
4	—	—	—	—	—	31500	—	—	38700	—	—	54900	—	—	77400	—	—	109000
5	—	—	—	—	—	50500	—	—	62000	—	—	88000	—	—	124000	—	—	175000

TABLE NO. 6—RETURN PIPE CAPACITIES FOR LOW PRESSURE SYSTEMS
CAPACITY EXPRESSED IN POUNDS PER HOUR
(Reference to this table will be made by column letter M through EE)

This table is based on pipe size data developed through the research investigagion of the American Society of Heating and Ventilating Engineers.

CAPACITY OF RETURN MAINS AND RISERS

MAINS

Pipe Size Inches	1/12 Psi or ½ oz. Drop per 100 ft.			1/24 Psi or ¼ oz. Drop per 100 ft.			⅛ Psi or 1 oz. Drop per 100 ft.			⅙ Psi or 2 oz. Drop per 100 ft.			¼ Psi or 4 oz. Drop per 100 ft.			½ Psi or 8 oz. Drop per 100 ft.		
	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.
M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE
¾	—	—	—	—	—	42	—	—	100	—	—	142	—	—	200	—	—	283
1	125	62	—	145	71	143	175	80	175	250	103	249	350	115	350	—	—	494
1¼	213	130	—	248	149	244	300	168	300	425	217	426	600	241	600	—	—	848
1½	338	206	—	393	236	388	475	265	475	675	340	674	950	378	950	—	—	1340
2	700	470	—	810	535	815	1000	575	1000	1400	740	1420	2000	825	2000	—	—	2830
2½	1180	760	—	1580	868	1360	1680	950	1680	2350	1230	2380	3350	1360	3350	—	—	4730
3	1880	1460	—	2130	1560	2180	2680	1750	2680	3750	2250	3800	5350	2500	5350	—	—	7560
3½	2750	1970	—	3300	2200	3250	4000	2500	4000	5500	3230	5680	8000	3580	8000	—	—	11300
4	3880	2930	—	4580	3350	4500	5500	3750	5500	7750	4830	7810	11000	5380	11000	—	—	15500
5	—	—	—	—	—	7880	—	—	9680	—	—	13700	—	—	19400	—	—	27300
6	—	—	—	—	—	12600	—	—	15500	—	—	22000	—	—	31000	—	—	43800

RISERS

¾	—	48	—	—	48	143	—	48	175	—	48	249	—	48	350	—	—	494
1	—	113	—	—	113	244	—	113	300	—	113	426	—	113	600	—	—	848
1¼	—	248	—	—	248	388	—	248	475	—	248	674	—	248	950	—	—	1340
1½	—	375	—	—	375	815	—	375	1000	—	375	1420	—	375	2000	—	—	2830
2	—	750	—	—	750	1360	—	750	1680	—	750	2380	—	750	3350	—	—	4730
2½	—	—	—	—	—	2180	—	—	2680	—	—	3800	—	—	5350	—	—	7560
3	—	—	—	—	—	3250	—	—	4000	—	—	5680	—	—	8000	—	—	11300
3½	—	—	—	—	—	4480	—	—	5500	—	—	7810	—	—	11000	—	—	15500
4	—	—	—	—	—	7880	—	—	9680	—	—	13700	—	—	19400	—	—	27300
5	—	—	—	—	—	12600	—	—	15500	—	—	22000	—	—	31000	—	—	43800

Sizing Piping for One-Pipe Vapor Systems

(1) Piping for one-pipe vapor systems is sized so as to permit only a few ounces pressure drop in the system.

(2) The method follows that outlined in sizing for one-pipe gravity air vent systems.

Sizing Piping for Two-Pipe Gravity Air Vent Systems. Piping for two-pipe low pressure systems is sized in the same manner as for two-pipe vapor systems, except that the pressure drop throughout the system can be based on ½ psi to 1 psi drop.

Sizing Piping for Two-Pipe Vapor Systems

(1) Small vapor systems when the equivalent length of run does not exceed 200 feet, shall be sized by means of Tables 4, 5, and 6.

(a) Main and any run-outs to risers that may be dripped shall be sized for about 1/16 psi drop per 100 feet, use Column D.

(b) For riser run-outs not dripped and radiator run-outs use Column I.

(c) For up-feed steam risers, use Column H.

(d) For returns, use Column U, the upper portion for mains and the lower portion for risers.

(2) A down-feed system shall be sized as follows:

(a) For the main vertical riser, use Column H.

(b) For down-feed risers, use Column D, using 1/16 psi drop.

(3) For vapor systems over 200 feet of equivalent length, the drop shall not exceed 1/8 to ¼ psi.

(4) For vapor systems with a 400 foot equivalent run, the drop shall not be over 1/32 psi per 100 feet and shall be sized by means of Tables 4, 5, and 6.

(a) For steam mains, use Column B.

(b) For radiator and undripped riser run-outs, use Column I.

(c) For the risers, use Column B.

(d) On a down-feed system, Column B shall be used for both the main riser and the smaller riser feeding the radiators in order not to increase the drop over 1/32 psi.

(e) The return risers from the lower portion of Column O and the dry return main from the upper portion of the same column, any wet returns from Column N. The same pressure drop is applied on both the supply and return sides of the system.

(5) Pitch of mains shall not be less than ¼ inch in 10 feet.

(6) Pitch of horizontal run-outs to risers and radiators shall not be less than ½ inch per foot. Where this pitch cannot be obtained, run-outs over 8 feet in length shall be one size larger than called for in the table.

(7) No supply main less than 2 inches in diameter shall be used.

(8) Supply mains, supply risers, or run-outs to supply risers shall be dripped separately into a wet-return or may be connected into the dry-return through a thermostatic drip trap.

Sizing Piping for Two-Pipe Vacuum Systems

(1) Vacuum, atmospheric, sub-atmospheric, and orifice systems are usually employed in large installations and have total drops varying from ¼ to ½ psi.

(2) Systems in which the maximum equivalent length does not exceed 200 feet, usually are designed for the ¼ psi pressure drop.

(3) Systems in which the maximum equivalent length exceeds 200 feet, usually are designed for higher drop (½ psi), owing to the relatively greater swing in pipe sizes.

(4) For example, a system with 1200 feet longest equivalent length of run would be designed for a pressure drop per 100 feet of ½ psi divided by 12, or ½₄ psi. The piping would then be sized by means of Tables 4, 5, and 6.

(a) For the steam main, use Column C.

(b) For the risers, use Column C (Column H could be used as far as critical velocity is concerned, but the drop would exceed the limit of ½₄ psi.)

(c) Riser run-outs, if dripped, use Column C.

(d) Riser run-outs, undripped, use Column I.

(e) Pipe sizes for other parts would be obtained as follows:

1) Radiator run-outs, Column I.

2) Return risers from lower part of Column B.

3) Return run-outs to radiators — one-pipe size larger than the radiator trap connection.

(5) Pitch of mains shall not be less than ¼ inch in 10 feet.

(6) Pitch of horizontal run-outs to risers and radiators shall not be less than ½ inch per foot. Where this pitch cannot be obtained, run-outs over 8 feet in length should be one size larger than called for in the table.

(7) When necessary, the supply mains, supply riser or run-out to a supply riser shall be dripped separately through a trap into the vacuum return. A connection shall not be made between the steam and return sides of a vacuum system without interposing a trap to prevent the steam from entering the return line.

(8) Lifts should be avoided, if possible; but when they cannot be eliminated, they shall be made in the manner described in the ASHRAE Guide and Data Book —Applications — Chapter 92.

(9) No lifts can be used in orifice and atmospheric systems.

APPENDIX III
(Relating to Section SBC 7638 of the Code)

Hot Water — Closed System

Water to be Circulated (G.P.M.). The gallons per minute to be circulated for any given system shall be calculated from the following formula:

$$G.P.M. = \frac{\text{Total Heat Loss, Btu per hour}}{20 \times 60 \times 8}$$

Where

20=20 degree temperature drop

60=minutes per hour

8=pounds per gallons, water at 215° F.

Equivalent Length of Pipe

(1) The length of pipe in the longest circuit shall be measured and the number of fittings determined.

(2) The total equivalent length of these fittings in terms of the average pipe size shall be calculated and added to the actual length to give the total equivalent length.

(3) Table 1 gives the elbow equivalents for different types of fittings.

Table 2 gives the equivalent length of pipe for 90 degree elbows for various flow rates.

(4) Loss of Head

(a) The loss of head in one elbow can be expressed in terms of the velocity head by the formula:

$$h = \frac{V^2}{2g}$$

Where

h=the loss of head in feet

v=the velocity of approach in feet per second

2g=2x32.2=64.4 feet per second

TABLE No. 1—IRON AND COPPER ELBOW EQUIVALENTS

FITTING	Iron Pipe	Copper Tubing
Elbow, 90 deg.	1.0	1.0
Elbow, 45 deg.	0.7	0.7
Elbow, 90 deg. long turn	0.5	0.5
Elbow, welded, 90 deg.	0.5	0.5
Reduced Coupling	0.4	0.4
Open return bend	1.0	1.0
Angle radiator valve	2.0	3.0
Radiator or convector	3.0	4.0
Boiler or Heater	3.0	4.0
Open gate valve	0.5	0.7
Open globe valve	12.0	17.0

TABLE No. 2—EQUIVALENT LENGTH OF PIPE FOR 90 DEGREE ELBOWS

Vel. FPS	PIPE SIZE ½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12
1	1.2	1.7	2.2	3.0	3.5	4.5	5.4	6.7	7.7	8.6	10.5	12.2	15.4	18.7	22.2
2	1.4	1.9	2.5	3.3	3.9	5.1	6.0	7.5	8.6	9.3	11.7	13.7	17.3	20.8	24.8
3	1.5	2.0	2.7	3.4	4.2	5.4	6.4	8.0	9.2	10.2	12.5	14.6	18.4	22.3	26.5
4	1.5	2.1	2.8	3.7	4.4	5.6	6.7	8.3	9.6	10.6	13.1	15.2	19.2	23.2	27.6
5	1.6	2.2	2.9	3.9	4.5	5.9	7.0	8.7	10.0	11.1	13.6	15.8	19.8	24.2	28.8
6	1.7	2.3	3.0	4.0	4.7	6.0	7.2	8.9	10.3	11.4	14.0	16.3	20.5	24.9	29.6
7	1.7	2.3	3.0	4.1	4.8	6.2	7.4	9.1	10.5	11.7	14.3	16.7	21.0	25.5	30.3
8	1.7	2.4	3.1	4.2	4.9	6.3	7.5	9.3	10.8	11.9	14.6	17.1	21.5	26.1	31.0
9	1.8	2.4	3.2	4.3	5.0	6.4	7.7	9.5	11.0	12.2	14.9	17.9	21.9	26.6	31.6
10	1.8	2.5	3.2	4.3	5.1	6.5	7.8	9.7	11.2	12.4	15.2	17.7	22.2	27.0	32.0

(b) The loss of head in tees when water is diverted at right angles through a branch of the tee varies with the per cent diverted.

(c) When the water diverted is less than 60% of that approaching the tee, the loss of head, in elbow equivalents, may be expressed as follows:

$$h^e = \frac{V_1^2}{\frac{1}{V_2^2}} \quad \text{Formula (2)}$$

Where

h^e=the loss of head in elbow equivalents

V_1=the velocity of approach

V_2=the velocity of water diverted at right angles.

(d) Values in elbow equivalents for the most common percentages of water diverted in a 1x1x1 inch tee are as follows:

25%=16.0 33%= 9.0 50%= 4.0 100%= 1.8

(e) For other percentages the approximate values may be secured by interpolation. When the water is diverted from the tee into a smaller size branch as in a 1x1x¾ inch tee, approximate values may be secured by means of Formula (2).

(f) In small systems the equivalent length can be estimated by adding a percentage to the measured total length of the circuit, usually 50%.

Size of Pipe to be Installed

(1) Having determined the equivalent length of pipe in the longest circuit and the total gallons per minute for the entire system, the sizes of pipes to be installed throughout the various parts of the systems shall be determined from Table 3.

(2) The following example will illustrate the method of using said Table: Taking as an example a system of 235,000 Btu total radiation and a calculated equivalent length of 285 feet, the procedure would be as follows:

$$\frac{235{,}000}{20\text{x}60\text{x}8} = 24.5 \text{ gallons per minute}$$

Reading down the left-hand column of Table 3, 25 gallons per minute is found to be the closest figure. Reading across to the right, 283 feet appear to be the equivalent length most nearly that of the one under consideration. Reading down from this figure to the column of friction resistance, it is found that the resistance in milinches per foot is 360. Using this figure, all of the various pipe sizes can be selected for their actual capacity in the lower part of the table. The final calculation for total resistance in feet of head is made by multiplying milinch resistance by the equivalent length of the longest circuit and converting to feet. In this instance —

$$\frac{283\text{x}360}{12\text{x}1000} = 8.5 \text{ feet}$$

12=inches per foot

1000=milinches per inch

(3) Consequently, the pump in this instance should be one capable of circulating 25 G.P.M. against an 8.5 foot head. It is particularly important that the pump installed shall have an actual capacity equal to that required. Otherwise, regardless of boiler capacity, pipe sizes and radiation amounts the system will not deliver the required heat.

TABLE No. 3—HOT WATER HEATING—PIPE SIZES

G.P.M	EQUIVALENT LENGTH OF PIPE—AVERAGE SIZE											
2.5	100	120	150	200	225	250	300	375	400	450	510	600
5	84	100	125	167	188	208	250	312	333	375	428	500
7.5	66	80	100	133	150	167	200	250	270	300	340	400
10	116	140	175	223	263	291	350	437	463	525	595	700
12.5	100	120	150	200	225	250	300	375	400	450	510	600
15	150	180	225	300	337	375	450	562	593	675	758	900
17.5	140	150	210	280	318	353	425	530	563	632	720	850
20	133	160	200	266	300	333	400	500	533	600	685	800
22.5	116	140	175	223	263	291	350	437	463	525	595	700
25	283	340	425	566	638	706	850	1062	1103	1275	1417	1700
30	274	330	412	550	620	695	825	1030	1085	1235	1390	1650
35	266	320	400	533	600	666	800	1000	1070	1200	1370	1600
40	249	300	375	500	563	623	750	937	973	1125	1252	1500
45	217	260	325	433	483	540	650	812	843	975	1088	1300
50	183	220	275	366	413	457	550	687	713	825	923	1100
55	390	470	587	782	882	972	1175	1468	1566	1757	1903	2350
60	383	460	575	766	863	955	1150	1437	1533	1725	1897	2300
65	366	440	550	733	825	916	1100	1375	1466	1650	1885	2200
70	349	420	525	700	788	872	1050	1312	1363	1575	1737	2100
75	333	400	500	666	750	833	1000	1250	1333	1500	1715	2000
80	317	380	475	633	713	789	950	1187	1233	1425	1577	1900
85	300	360	450	600	675	750	900	1125	1200	1350	1540	1800
90	266	320	400	533	600	666	800	1000	1070	1200	1370	1600
95	233	280	350	465	525	580	700	875	933	1050	1200	1400
100	200	240	300	400	450	500	600	750	800	900	1030	1200
110	400	480	600	800	900	1000	1200	1500	1600	1800	2030	2400
120	333	400	500	666	750	833	1000	1250	1333	1500	1715	2000
130	266	320	400	533	600	666	800	1000	1070	1200	1370	1600
140	200	240	300	400	450	500	600	750	800	900	1030	1200
150	317	620	775	1023	1163	1290	1550	1935	2060	2325	2620	3100
160	466	560	700	933	1050	1167	1400	1750	1870	2100	2370	2800
170	400	480	600	800	900	1000	1200	1500	1600	1800	2030	2400
180	333	400	500	666	750	833	1000	1250	1333	1500	1715	2000
190	266	320	400	533	600	666	800	1000	1070	1200	1370	1600
200	200	240	300	400	450	500	600	750	800	900	1030	1200

TABLE NO. 3—Continued

FRICTION HEAD IN MIL INCHES PER FOOT OF PIPE

	360	300	240	180	160	144	120	95	90	80	70	60
BTU CAPACITY OF VARIOUS PIPE SIZES IN M. B. H.												
½"	15.5	13	12.4	10	9.6	9	8.2	6.8	6.7	6.3	6.0	4.8
¾"	31	29	26.4	22	20.6	19.6	17.2	14.6	14.	13.	12.5	11.
1"	59	53	47	40	38	36	32	30	28	27	24	23.5
1¼"	124	118	101	85	80	77	69	62	58	55.6	51	48
1½"	193	175	155	132	124	120	106	93	90	83	78	71
2"	360	322	287	248	235	223	198	190	170	160	148	137
2½"	620	551	500	440	395	380	340	300	290	270	250	230
3"	1100	1000	900	760	710	660	600	540	510	480	440	410
3½"	1700	1500	1320	1120	1050	1000	500	800	770	730	670	610
4"	2350	2100	1900	1610	1500	1420	1260	1100	1080	1000	940	850
4½"	3300	3000	2700	2300	2000	1800	1650	1450	1400	1340	1250	1200
5"	4600	4100	3600	3000	2750	2600	2300	2200	2100	1950	1800	1700

TOTAL FRICTION HEAD IN FEED—EQUIVALENT LENGTH X MIL INCHES

12X1000

SBC 7701 VENTILATION. Definitions. The following terms shall mean:

AIR CONDITIONING. The process of treating air so as to control simultaneously its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space. The classifications of air conditioning are included in this chapter as follows:

Winter air conditioning which shall include the proper distribution of the cleaned, humidified, and heated air to and within the spaces to be conditioned.

Summer air conditioning which shall include the proper distribution of the cleaned, dehumidified, and cooled air to and within the spaces to be conditioned.

VENTILATION. The process of supplying and/or removing air by natural or mechanical means to or from any space in a manner which will protect the health, safety and comfort of the occupants of that space. Such air may or may not have been conditioned.

SBC 7702 General Requirements

(1) For the purpose of this code, the minimum quantity and quality of outside and recirculated air for ventilation and air conditioning purposes shall be in compliance with the requirements of this chapter.

(2) The ventilation requirements, as herein stated, shall apply to every room hereafter designed, erected, altered, or converted for the purposes enumerated.

(3) Heating Systems Required. Heating systems complying with the requirements of this code shall be provided, maintained, and operated for all occupied areas within the scope of this code. See Chapter 73, "Load Calculations — Heating — Cooling and Ventilating", and Chapters 75, 76 and 83.

(4) Cooling Systems. Cooling systems complying with the requirements of this code may be provided, maintained, and operated for occupied areas within the scope of this code. See Chapters 73 and 78.

(5) Ventilating Systems Required. Ventilating systems complying with the requirements of this code shall be provided, maintained, and operated to accomplish required ventilation for all occupied areas within the scope of this code.

(6) Exhaust Systems. Exhaust systems shall discharge the air in such a manner whereby the discharge from the system will be prevented from contaminating the breathing zone inside the building or re-entering any occupied area.

(7) Air Supply.

(a) Where ventilation is secured by exhaust methods, a supply of outside air shall be provided to replace the air exhausted from the area, if the volume of air exhausted exceeds one air change per hour. It is desirable that the air supply should be tempered.

(b) The heat generated by kitchen appliances or other internal heat sources may be conserved by mixing room air with a quantity of outside air

provided that dampers and temperature controls are designed into the system to maintain a minimum supply temperature of not less than 55 degrees F.

(8) Contamination of Adjacent Area. All equipment and service rooms, which house sources of odors, fumes, noxious gases, excessive smoke, steam, dust, spray, or other contamination detrimental to health, safety, or comfort shall be ventilated in a manner which prevents spreading of any such contamination to other parts of the building.

(9) Final Test Required. The performance of every heating, ventilating, and air conditioning air distribution system shall be tested and balanced in place. Whenever plans, specifications, and other data are required, a written record of the final results of such testing and balancing shall be made and a copy thereof filed with the administrative authority.

SBC 7703 Drawings, Specifications, and Data

(1) Approval of Drawings and Specifications. Complete drawings, specifications, and data sheets in duplicate for heating, ventilating, and air conditioning of all classes of buildings and occupancies within the scope of this code shall be submitted in order to evaluate compliance with this code. Approval shall be obtained before the effected work is begun.

(2) Approval of Changes on Drawings. Where it is necessary to change the approved drawings or specifications covered by this code, revised drawings in duplicate shall be submitted in order to evaluate compliance with this code before the effected work is begun.

(3) Information Required on Drawings and in Specifications. All information shown on the drawings shall be permanent, clear, legible, and complete, and shall include all details and data necessary for review of the proposed installation, such as:

(a) Name of the owner of the building.

(b) Proper address of the building.

(c) Architect, engineer, or designer's name shall appear on the title sheet.

(d) A floor plan for each floor where equipment is installed shall be furnished as part of the set of drawings.

(e) A room schedule, indicating the intended use of all rooms.

(f) Elevation and sectional plans to illustrate and clarify equipment arrangements.

(g) Location, size, and type of all principal units of equipment.

(h) Size and continuity of all ducts and vents.

(i) Description and location of chimney or chimneys.

(j) Specifications shall be properly identified with and completely supplement the drawings.

(4) Data Required. All drawings submitted for review shall be accompanied by data indicating sufficient information to determine if the capacity of the equipment and the performance of the system will meet the minimum requirements of this code. The following data shall be submitted:

(a) Heat loss calculated in BTU per hour.

(b) Cooling load calculated in BTU per hour.

(c) Ventilation requirements and calculations.

(d) Summation of total heating, ventilating, and cooling requirements.

SBC 7704 Design Requirements

(1) Installation of Equipment. All heating, ventilating, air conditioning and refrigeration installations shall be designed and installed to provide the service and results required by this code.

(2) Air Cleaning Apparatus. Where air cleaning apparatus is installed, it shall be accesible for maintenance.

(3) Maximum Inlet Temperature. The room inlet temperature of air leaving the register or grills used for heating and ventilating purposes shall be designed on the basis not to exceed 140 degrees F.

(4) Air Quantity. The quantity of air used to ventilate a given space during periods of occupancy shall be sufficient to maintain the standards of air temperature, air quality, air motion, and air distribution as required by this code.

(5) Controls. Where ventilation is required by this code, controls shall be provided so that the minimum air circulation, supply, and exhaust shall be maintained during periods of occupancy.

SBC 7705 Occupancy Classification. The various occupancies to which the provisions of this code apply are classified as follows:

Class 1. Those which require ventilation on an occupancy basis.

Class 2. Those which require supply or exhaust ventilation on an occupancy basis unless otherwise exempted.

Class 3. Those which require exhaust.

Class 4. Those which require ventilation on the basis of floor area.

NOTE: The following (Table 1) indicates the individual classifications of occupancies within the scope of this code together with the method to be used in establishing the number of persons for which ventilation is to be provided.

TABLE NO. 1
MINIMUM STANDARD OCCUPANCY CLASSIFICATION

USE OR OCCUPANCY	CLASSIFICATION	BASIS OF CAPACITY
Arenas and Field Houses	(1)	4 sq. ft. per person. Use seated area only.
Armories (drill halls)	(1)	30 sq. ft. per person.
Assembly halls	(1) or (2)	7 sq. ft. per person—See SBC 7717.
Banquet halls	(1) or (2)	15 sq. ft. per person—See SBC 7717.
Bath and shower rooms	(3)	See SBC 7713.
Barber shops	(2)	20 sq. ft. per person—See SBC 7717.
Beauty parlors	(2)	20 sq. ft. per person—See SBC 7717.
Billiard rooms	(1) or (2)	15 sq. ft. per person—See SBC 7717.
Bowling alleys	(1) or (2)	Seating capacity plus 6 persons per alley. Terminate occupied area at foul line. See SBC 7717.
Brokerage boardrooms	(1) or (2)	7 sq. ft. per person—See SBC 7717.
Cafeterias	(1) or (2)	15 sq. ft. per person—See SBC 7717.
(Churches and other places of worship	(2)	Dining room: 15 sq. ft. per person. See SBC 7708.
Sunday School rooms)	(2)	15 sq. ft. per person—See SBC 7708.
Club rooms	(1) or (2)	7½ CFM per person.
Dance halls	(1) or (2)	15 sq. ft. per person—See SBC 7717.
Dining rooms	(1) or (2)	15 sq. ft. per person—See SBC 7717.
Dry cleaners	(3)	4 CFM per sq. ft.
Embalming rooms, autopsy rooms, and morgues	(4)	3 CFM per sq. ft. (exhaust)
First aid rest rooms	(1) or (2)	15 sq. ft. per person—See SBC 7717.
Funeral homes	(2)	See SBC 7718.
Garages and service stations	(4)	See SBC 7718.
General offices	(1) or (2)	See SBC 7716.

TABLE NO. I — (Continued)

USE OR OCCUPANCY	CLASSIFICATION	BASIS OF CAPACITY
(Gymnasiums and combined gymnasiums and assembly halls)	(1)	6 sq. ft. per person for seated space; 15 sq. ft. per person for space not seated.
Hospitals	(1) or (2)	See SBC 7720.
Nursing Homes	(1) or (2)	See SBC 7720.
Janitor closets	(3)	See SBC 7713 and SBC 7720.
Kitchens	(3)	See SBC 7714.
Laboratories	(1) or (3)	25 sq. ft. per person.
Laundries	(3)	15 CFM per person or 1½ air changes per hour, whichever is greater.
Lecture halls	(1)	7 sq. ft. per person Use seated areas only.
Library reading rooms	(1)	20 sq. ft. per person.
Locker rooms	(3) or (4)	See SBC 7712.
Lodge halls	(1) or (2)	6 sq. ft. per person for seated areas; 15 sq. ft. per person for space not seated. See SBC 7717.
Mental hospitals	(1) or (2)	See SBC 7719.
Motion picture booth	(1) or (3)	See SBC 7709.
Penal institutions	(1) or (2)	See SBC 7719.
Playroom unfinished area	(3)	23 sq. ft. per person.
Restaurants	(1) or (2)	15 sq. ft. per person—See SBC 7717.
Retail establishments	(1) or (2)	Basement: 40 sq. ft. per person. Other floor: 60 sq. ft. per person. See SBC 7717.
School all-purpose, dining and recreation rooms	(1)	15 sq. ft. per person.
School auditorium	(1)	7 sq. ft. per person.
School classroom	(1)	23 sq. ft. per person.
School kindergarten rooms	(1)	23 sq. ft. per person.
School lecture rooms	(1)	7 sq. ft. per person. Use seated area only.
School project rooms	(1)	23 sq. ft. per person.
School study rooms	(1)	16 sq. ft. per person.

TABLE NO. I — (Continued)

USE OR OCCUPANCY	CLASSIFICATION	BASIS OF CAPACITY
Security vault (occupied)	(4)	2 CFM per sq. ft.
Skating rinks	(1) or (2)	15 sq. ft. per person. See SBC 7717.
Swimming pools	(3)	See SBC 7713.
Taverns	(1) or (2)	20 sq. ft. per person—See SBC 7717.
Theaters	(1)	7 sq. ft. per person.
Theater lobbies	(1)	15 sq. ft. per person.
Theater lounge rooms	(1)	15 sq. ft. per person.
Toilet rooms	(3)	See SBC 7713.
Vocational instruction and research	(1) or (3)	40 sq. ft. per person.
Wardrobes, locker, and cloak rooms	(3)	See SBC 7712.

NOTE: Air which has been exhausted and reconditioned by air conditioning equipment which simultaneously controls the temperature, humidity, and cleanliness of the air may be recirculated as equivalent fresh air, except where drawn from a toilet room, kitchen, operating room, mortuary, or room or space where hazardous dust, fumes or gases, or objectionable odors are present. The air recirculated must be supplemented by at least 10% fresh air.

SBC 7706 General Requirements for Occupancies Under (1) and (2) Classifications

(1) Scope. The requirements of SBC 7706 shall apply to all occupancies listed under (1) and (2) in Table I, unless otherwise exempted by this code.

(2) Air Movements. The total air circulated (recirculated plus outside air) for all occupancies in this classification shall not be less than 6 air changes per hour unless otherwise provided by this code.

(a) The air delivery capacity of all equipment supplying air for heating, ventilating, and air conditioning purposes shall be based on standard air rating (70 degrees db and 29.92 inches).

(b) For installations, where cooling is provided and the heat gain requirements for the space have been satisfied, an air movement of less than 6 air changes per hour may be permitted.

(3) Outside Air Supply. The outside air supply during occupancy shall not be less than 7½ cubic feet per minute per occupant and an equal amount shall be exhausted unless otherwise exempted by this code. See SBC 7705 for method used in determination of capacity.

(4) Air Distribution. All air outlets and returns shall be so located, arranged, or equipped to provide distribution of air without objectionable air motion.

(5) Recirculation. No air contaminated by other than human occupancy shall be used for recirculation, except within the same occupancy classification.

(6) Automatic Controls. Automatic controls shall be provided to maintain temperature and ventilation to satisfy the following conditions during periods of occupancy.

(a) Provide a continuous air movement of not less than the minimum required by this code.

(b) Provide a supply of tempered outside air as determined by the number of occupants of not less than 7½ cubic feet of air per minute per person.

(c) Maintain design temperature.

(7) Air Cleaning Devices. Approved air cleaning devices shall be installed in a manner to filter the outside air and recirculated air used with mechanical heating and ventilating systems except as follows:

(a) Filters are not required for use with unit heaters designed for heating and recirculation.

(b) Where jet systems or blend air systems are approved, air filters are not required in the ducts that are installed for the recirculation of air within the same occupied space.

NOTE: Filters carrying the Fire Underwriters' approved label will be recognized as approved.

SBC 7707 General Requirements: Places of Assembly

(1) Scope. This classification shall include all occupancies such as arenas, armories, assembly halls, banquet halls, billiard rooms, bowling alleys, cafeterias, club rooms, dance halls, dining rooms, restaurants, school auditoriums, skating rinks, and theaters.

NOTE: The above occupancies which accommodate less than 100 persons shall conform to the requirements of SBC 7717.

(2) Air Movement, Supply, and Distribution. The air movement, supply, and distribution for all occupancies under this classification shall conform to the requirements of SBC 7706.

(a) For theaters, assembly halls, gymnasiums, and similar occupancies having a ceiling height of 15 feet or more, the total air supply shall be based on at least 6 air changes per hour.

(b) For theaters, assembly halls, gymnasiums, and similar occupancies having a ceiling height of less than 15 feet, the total air supply shall be based on at least 7½ air changes per hour.

(3) Stages. The stage in any theater or assembly hall for which a fire curtain is required, shall be supplied with sufficient air or other means to equalize the pressure to avoid deflecting the curtain.

(4) Alternate Service and Capacity. Heating and ventilating systems installed in so-called community buildings and lodge halls may be arranged for selective delivery of the entire supply to either the first floor or to the basement floor area provided these areas are not used simultaneously.

SBC 7708 General Requirements: Churches, Etc.

(1) Scope. This classification shall include auditoriums, social assembly rooms, Sunday School rooms, and similar areas which are part of churches or houses of worship. It shall also include chapels used in connection with funeral homes, as well as those in parochial schools, convents, and similar occupancies.

(2) Air Movement, Supply, and Distribution. The air movement, supply, and distribution for all occupancies under this classification shall conform to the requirements of SBC 7706 except that no ventilation will be required where the total openable area of the outside doors and windows is greater than 3% of the floor area served, or that in funeral homes the openable area of the outside doors and windows shall be greater than 5% of the floor area served.

(3) Alternate Service. Heating and ventilating systems installed in occupied areas of this class may be arranged for selective delivery of the required supply to either the auditorium floor area or to the basement floor area provided these areas are not used simultaneously.

SBC 7709 General Requirements: Motion Picture Booths

(1) Inlet. Fresh-air inlets shall be provided from the exterior of the building and shall have an area not less than one square foot protected with wire screen and installed within two inches of the projection room floor. Fresh-air inlets other than those directly to the outside shall be protected by approved fire shutters.

(2) Exhaust.

(a) Ventilation shall be provided by one or more mechanical exhaust systems which shall draw air from each arc lamp housing and from one or more points near the ceiling. Systems shall exhaust to the outdoors either directly or through an incombustible flue used for no other purpose. The ventilation rate shall be not less than 15 cfm nor more than 50 cfm for each arc lamp plus 200 cfm for the room itself.

Systems shall be controlled from within the enclosure and have pilot lights to indicate operation. The exhaust system serving the projection room may be extended to cover rooms associated therewith, such as re-wind rooms. No dampers shall be installed in such exhaust systems.

(b) Exhaust ducts shall be of incombustible material and shall either be kept one inch from combustible material or covered with one-half inch of incombustible insulation.

(3) Shutters.

(a) Each port and every other opening in projection room walls, including any fresh-air inlets, but excluding exit doors and exhaust ducts, shall be provided with a shutter of not less than 10 U.S. Gauge sheet metal or its equivalent large enough to over lap at least one inch on all sides of such opening.

Shutters shall be arranged to slide without binding in guides constructed of material equal to the shutters in strength and fire resistance. Each shutter shall be equipped with a 165 degree F. fusible link, which when fused by heat will cause closure of the shutter by gravity. There shall also be a fusible link over the upper magazine of each projector, which upon operating, will close all the shutters. In addition, there shall be provided a suitable

means for manually closing all shutters from any projector head and from a point within the projection room near each exit door.

(b) Shutters may be omitted when acetate (safety) film only is used.

SBC 7710 General Requirements: Schools

(1) Scope. This classification shall include all class, study, recitation, lecture, project rooms, kindergartens, library, reading rooms, and similar areas in all school, college, and library buildings used for educational purposes. (See Section SBC 7706 for assembly rooms.)

(2) Air Movement and Supply. The air movement and supply for all occupancies under this classification shall conform to the requirements of SBC 7705. For corridors and halls used in conjunction with occupied areas of this class the air movement shall not be less than 10 cfm per lineal foot of corridor or hall. This air supply shall be accomplished by means of air inlets admitting air from direct tempered air supply.

SBC 7711 General Requirements: Laboratories, Etc.

(1) Scope. This classification shall include all places for vocational instruction and research, such as laboratories, school shops, domestic science rooms, and similar occupied areas.

(2) Air Movement and Supply. The air movement and supply for all occupancies under this classification shall conform to the requirements of SBC 7705.

(3) Equipment and Process Exhaust. An exhaust ventilating system shall be provided in connection with all equipment and processes which create any dusts, fumes, vapors, or gases which may be injurious.

(4) Separate Exhaust Systems. Exhaust systems serving this classification shall be separate from, and independent of all other services and systems in the building.

SBC 7712 General Requirements: Wardrobes and Locker Rooms, Etc.

(1) Scope. This classification shall include all wardrobes, cloakrooms, locker rooms, and similar areas in all buildings within the scope of this code, except as noted herein.

(2) Ventilation Required. Ventilation shall be provided and maintained for all areas of this class. Wherever practicable, such ventilation shall be accomplished by exhaust methods and in any case the volume of the exhaust shall be greater than that of the supply.

(3) Minimum Air Movement. The air movement provided and maintained for areas of this class shall be not less than 2 cubic feet per minute per square foot of floor area.

(4) Wardrobes and Coat Rooms in School Buildings. Where necessary in order to insure practical results in wardrobes or coat rooms adjacent to or connected with occupied areas covered by SBC 7814, the required ventilation shall be accomplished by use of inlets admitting air from adjacent classrooms, or corridors, or similar areas in conjunction with outlets and ducts discharging directly to the outside of building.

(5) Locker Rooms in Conjunction with Toilet, Bath, and Swimming Rooms. Occupancies in this classification are required to have a tempered

air supply which may be exhausted through the adjoining toilet, shower, or swimming rooms.

(6) Fresh Air and Rest Rooms. Ventilation shall be provided for all areas of this class to conform to the requirements of SBC 7706. Mechanical ventilation is not required where the total sash area is greater than 10% of the floor area and where the openable area is at least 5%.

SBC 7713 General Requirements: Toilets, Pools, Etc.

(1) Scope. This classification shall include all toilets, bath and swimming pool rooms, janitor closets, sterilizing rooms, and similar spaces.

(2) Gravity or mechanical exhaust ventilation shall be provided for all such rooms or space except for rooms or spaces having not more than one bathroom group (water closet, bidet, lavatory, bathtub and/or shower) if said room or space has a minimum window area of three square feet, half of which is openable.

(3) Air Movement and Supply.

(a) The air movement, provided and maintained in janitor closets, sterilizing rooms and similar spaces shall not be less than 2 cubic feet per minute per square foot of floor area.

(b) Rooms or spaces having one bathroom group as provided above or less and no openable outside window shall be ventilated at the rate of one cubic foot per minute per square foot of floor area.

(c) Toilet rooms having more than one bathroom group as provided above shall be ventilated at the rate of two cubic feet per minute per square foot of floor area.

(d) The air movement in swimming pool areas and public baths shall not be less than 6 air changes per hour and the tempered air supplied and exhausted shall not be less than 2 cubic feet of air per minute per square foot of pool surface.

(4) Separate Exhaust Systems. Exhaust systems serving this class of occupancy shall be separate from, and independent, of all other services in the building.

SBC 7714 General Requirements: Commercial Kitchens

(1) Scope. This classification shall include all areas housing cooking of food in all buildings within the scope of this code, except residences and those classified under vocational instruction.

(2) Exhaust Ventilation. The exhaust ventilation required and maintained for every occupied area of this class shall not be less than 4 cubic feet per minute per square foot of floor area except that kitchens used occasionally in connection with church auditoriums, lodge halls, and schools the exhaust ventilation may be reduced to a minimum of 2 cubic feet per minute per square foot of floor area.

(3) Hoods. The design of range hoods shall provide for the effective removal of greasy fumes and excess heat. Acceptable hood designs, air volumes, and air velocities are shown in Figures 1, 2, and 3.

(a) Hoods over cooking or similar appliances must be constructed of noncombustible materials throughout, with tight sides and tops and have at least 18 inch clearance from all unprotected combustible materials.

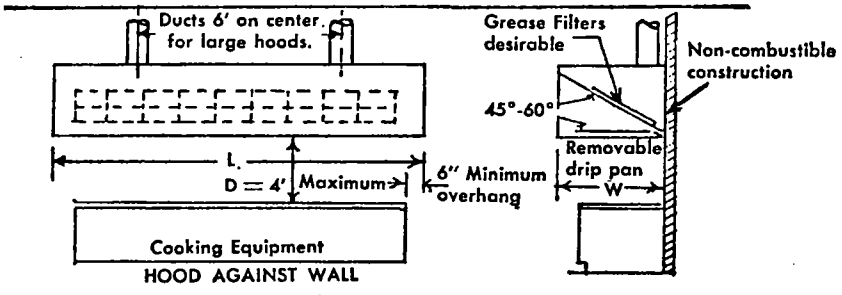
(b) The length and width of kitchen hoods must extend beyond the extreme projection of the ranges, broilers, etc., over which they are installed. The minimum projection or overlap shall be six inches.

(c) Where space conditions permit, range hoods should be two feet high to provide a reservoir to confine momentary bursts of smoke and steam until the exhaust system can evacuate the hood. Range hoods must be located as low as possible to increase their effectiveness, and not more than seven feet (7') from the floor.

(d) Exhaust connections to range hoods shall always be made at the top or back of hoods, and shall be spaced preferably not more than six feet (6') apart. Exhaust ducts shall be sized to maintain a velocity of 2000 to 3000 feet per minute.

KITCHEN HOODS

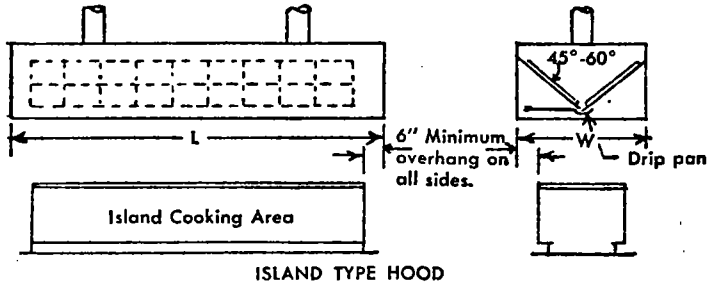
Figure 1.



HOOD AGAINST WALL

P=Perimeter of hood=2W+L
Q=80 cfm/square feet of hood area (80WL).
Not less than 50 cfm/sq. ft. of face area (50PD).
Duct velocity=2000-3000 fpm
Entry loss=0.25 inches (filter resistance) + 0.50 duct VP.
Grease filters—See Figure 3

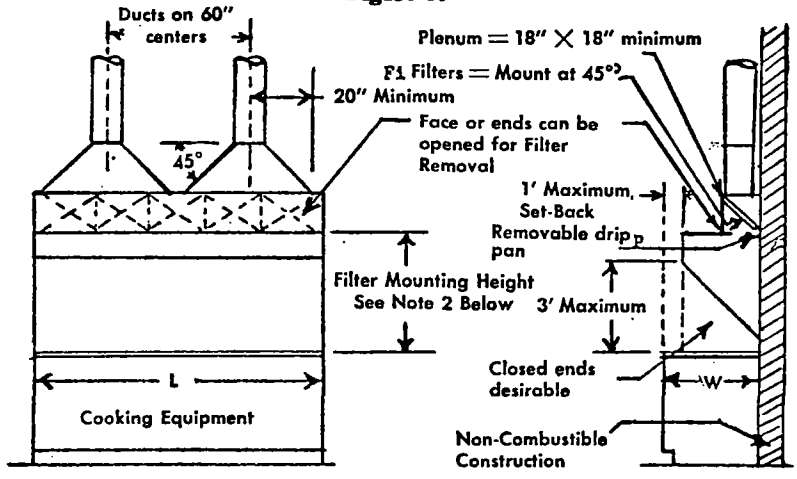
Figure 2.



ISLAND TYPE HOOD

P=Perimeter of hood=2W+2L
Q=125 cfm/square feet of hood area (125 WL).
Not less than 50 cfm/sq. ft. of face area (50PD).
Duct velocity=2000-3000 fpm
Entry loss=0.25 inches (filter resistance) + 0.50 duct VP.
Grease filters—See Figure 3

Figure 3.



LOW SIDE WALL HOOD

Q=200 cfm per lineal foot of cooking surface (200L)
Duct Velocity=2000-3000 fpm
Entry Loss=0.25 (filters) + 0.25 duct VP

FILTER REQUIREMENTS FOR KITCHEN HOODS

1. Number of filters shall be based on not more than 3 cfm for each square inch of filter area and shall be installed between 45 degrees to 60 degrees to horizontal.
2. Filter mounting height.
   a. No exposed cooking flame—2½ foot minimum to lowest edge of filter.
   b. Charcoal and similar fires—4½ foot minimum to lowest edge of filter.
   c. Other exposed fires—3½ foot minimum to lowest edge of filter.
3. An easily removable grease drip pan shall be provided and it should be pitched so that it will drain into the gutters of the hood.
4. Filter media shall be non-inflammable.

(4) Ducts. Ducts for carrying off greasy vapors and excess heat shall be of not less than No. 18 U.S. Gauge steel with grease-tight joints made by welding or equal processes.

(a) All duct work shall be properly secured to ceiling or joists or supported by substantial brackets when run along the walls.

(b) Exhaust ducts must have no connection with other house ventilating systems. They must not be connected to stacks, chimneys, or flues used for other purposes.

(c) Exhaust piping to range hoods, commonly called grease ducts, shall be provided with tight fitting cleanout doors of adequate size located every 10 feet on horizontal ducts but not located on the bottom of a duct. An approved type of filter shall be installed in all ducts or hoods over ranges, fry kettles, or any other cooking device where grease may accumulate.

(d) Ducts or vents connected to range hoods passing through or near combustible construction shall be installed in accordance with the National Fire Protection Association Standard for Ventilation of Restaurant Cooking Equipment. NFPA No. 96, Section 3, Ducts.

(e) Manufactured chimneys may be used without additional fire-resistive protection provided that such chimneys have been approved for use with low-heat appliances and tests for a continuous temperature of not less than 1000 degrees F. and 1400 degrees F. for infrequent periods.

SBC 7715 Residential Ventilation

(1) When power exhaust fans are used for range or range hood ventilation in the kitchen of single, double, or multiple dwellings, the installation shall comply with the following requirements:

(a) All ducts shall be galvanized iron of not less than 28 gauge.

(b) All seams in the duct system shall be tight. Pressure sensitive tape or other methods approved by the administrative authority can be used.

(c) Back draft dampers shall be provided near the outlet of the duct. These shall be in the closed position when the fan is not operating.

(d) A one-half inch mesh screen shall be installed at each exhaust outlet.

(e) Fans and duct systems shall be designed to permit cleaning and servicing.

(f) Insulation Required. Whenever a duct or fan scroll lies within 6 inches of a combustible material, it shall be insulated with ½ inch glass fiber insulation, two layers of 12-pound asbestos paper or the equivalent.

(g) When a kitchen range hood faces a combustible material less than 30 inches above the cooking surface, the hood shall be separated from the combustible material by ¼ inch asbestos board or equivalent.

(h) Ducts passing through unheated spaces shall be insulated with a minimum of one inch of glass fiber insulation or equivalent.

(i) Ducts located in a heated space shall be insulated with one inch of glass fiber insulation or equivalent for a distance of three feet from the duct outlet.

(2) Toilet rooms having only one fixture (water closet or urinal) and no openable outside windows shall be ventilated at the rate of at least one cubic foot per minute per square foot of floor area.

(a) See (h) and (i) preceding.

SBC 7716 Offices

(1) Scope. This classification shall include areas where clerical and administrative work is the chief usage.

(2) Ventilation Required. The air movement, supply, and distribution for this classification shall conform to the requirements of SBC 7706 unless each of the following requirements has been satisfied:

(a) The total openable area of outside doors and windows is not less than 3% of the floor area served.

(b) The available floor space for each occupant is not less than 75 square feet per person.

(c) Heat or odors are not present in sufficient quantities to be injurious to the health, safety, or comfort of the occupants.

SBC 7717 Retail Establishments

(1) Scope. This classification shall include barber shops, beauty parlors, brokerage board rooms, taverns, bowling alleys, retail establishments where goods and commodities are bought and sold, and places where not more than 100 persons assemble for recreation, entertainment, or dining purposes.

(2) Air Movement, Supply, and Distribution. The air movement, supply and distribution for all occupancies under this classification shall conform to the requirements of SBC 7706 unless the total openable area of outside doors and windows is more than 3% of the floor area served. No window or outdoor opening which is below grade will be considered unless there is a clear space outside the windows having a width of not less than one and one-half times the distance below grade at the bottom of the window.

SBC 7718 Garages and Service Stations

(1) Scope. Ventilation shall be provided for all repair garages, service stations, body shops, and all live storage garages, housing 6 or more vehicles driven by internal combustion engines.

NOTE: A live storage area is any area within a building used for the storage of fire trucks, tractors, automobiles, trucks, and other self-propelled vehicles driven in and out under their own power.

(2) Ventilation Required. Supply and exhaust ventilation shall be provided for all occupied areas in this classification during periods of occupancy.

(3) Storage Areas.

(a) Heated Live Storage Area. Areas used for the storage of 6 or more motor-driven vehicles and where heat is provided or required by this code, shall be provided with a tempered supply of outside air or uncontaminated recirculated air of not less than ¾ cubic foot per minute per square foot of floor area. Exhaust ventilation equal to the volume of air supplied must be provided for. This can be accomplished by either gravity or mechanical means. Pickups for exhaust ventilation shall be at or near the floor level.

(b) Unheated Live Storage Area. Areas used for the storage of 6 or more motor-driven vehicles and where heat is not required by this code, shall be provided with exhaust ventilation based on ¾ cubic foot of air per minute per square foot of floor area unless the following requirements have been satisfied:

The floor area shall be at or above grade level.

Permanent open wall of the included area shall not be less than 30% of the total wall area and shall be arranged to cause air circulation throughout the area. Any enclosed portion used for repair or servicing vehicles powered by internal combustion engines shall be provided with mechanical ventilation as required in SBC 7718(6).

(4) Basement and Underground Garages. Basement and underground garages shall be provided with mechanical ventilation having positive means of exhausting air at the rate of ¾ cubic foot per minute per square foot of floor area. An approved means of introducing an equal amount of outdoor or other uncontaminated air shall be provided. Air introduced shall be tempered to maintain the heating requirements of the ventilated space.

(5) Residential Garages. Private residential garages of 3 car capacity or less (when not used for commercial repair or commercial servicing operations) shall be exempted from the provisions of SBC 7718.

(6) Repair Areas.

(a) All areas in which the repairing of motor-driven vehicles is done shall be supplied with a volume of tempered outside air or uncontaminated air not less than ¾ cubic foot per minute per square foot of floor area. An equal volume of exhaust ventilation shall be provided and maintained.

(b) In addition to the ventilation requirements, exhaust gases from the internal combustion engines being tested shall be discharged to the outdoors through a duct or flexible hose of non-combustible material of suitable size attached as an extension to the exhaust pipe. Repair stalls may be located adjacent to an outside wall so that 10 feet or less of extension duct will reach the outdoors through openings not more than one foot above floor level. If repair stalls are not so located, each stall shall be provided with a suitable exhaust extension duct or flexible hose which shall be equipped with a device for connecting it to the exhaust pipe of the vehicle and the exhaust system. Each outlet shall be provided with a shutoff valve which may be closed when not in use. The mechanical exhaust system shall have a capacity in accordance with the following table:

TABLE II

EXHAUST REQUIREMENTS

TYPE	H.P.	CFM PER TAILPIPE	DIAMETER OF FLEXIBLE DUCT
Gasoline	200 and under	100	3 inches
Gasoline	Over 200	200	4 inches
Diesel	————	400	4½ inches

(7) No basement or sub-basement garage shall be used for the repair of motor-driven vehicles.

(8) Inspection and Repair Pits. Inspection and repairs pits shall be provided with a ventilating system capable of assuring one complete air change every 5 minutes. Floors of such pits shall have a minimum pitch of one inch for each 10 feet. The exhaust air inlet opening or openings shall terminate in a grille which shall be perpendicular to the floor. The bottom of the openings shall extend to the floor at the lowest point or points of the pit.

(9) Service Stations. Buildings of this classification shall include liquid fuel dispensing stations where vehicles can be driven into the building for washing, greasing, oil change, tire, or battery replacement or similar operations.

(a) All service rooms or work areas shall be provided with a tempered supply of outside air of not less than ½ cubic foot per minute per square foot of floor area and with the necessary gravity or mechanical vent or vents exhausting the same volume of air from a point not more than 18 inches above the floor.

(10) General Requirements.

(a) Ventilation shall be provided for show rooms or offices where such occupancies are located adjacent to repair or live storage areas and would

require ventilation in accordance with SBC 7706 unless the openable area or outside doors and windows exceed 3% of the floor areas. This requirement does not apply to service stations.

(b) There shall be no recirculation of air from any repair, live storage, or service area during periods of occupancy except where the total amount of air in circulation is in excess of the quantity required by this rule, the excess air may be recirculated.

(c) The air that is exhausted from the repair, live storage, and service areas in a building shall be removed at a point not more than 18 inches above the floor through properly distributed vent ducts located in areas of greatest contamination. Where the exhaust is by gravity, the vent duct or ducts shall extend from a point not more than 18 inches above the floor line up through the roof of the building and shall be capped with an approved siphon-type roof ventilator extending at least 2 feet above the high point of the roof or above the top of the parapet whichever is higher — unless otherwise approved.

SBC 7719 Penal Institutions, Etc.

(1) Scope. This classification shall include corridors and areas of compulsory occupancy in penal institutions, mental hospitals, and other places of detention.

(2) Air Movement, Supply, and Distribution. The air movement, supply, and distribution for all occupancies under this classification shall be accomplished by mechanical means and shall conform to the requirements of SBC 7704 and SBC 7705. The air movement through corridors shall be a minimum of 10 cubic feet per minute per lineal foot of corridor.

(3) Overnight Lock-ups. Where cells are provided for not more than 6 occupants for the purpose of overnight detention only, exhaust ventilation shall be provided on the basis of at least 6 air changes per hour for the occupied area.

SBC 7720 Hospitals and Nursing Homes. All heating, ventilating, and air conditioning in hospitals and nursing homes shall conform to Minnesota Statutes and the current Regulations of the Minnesota State Board of Health for the Construction, Equipment, Maintenance, Operation, and Licensing of Hospitals and Nursing Homes, adopted pursuant thereto.

SBC 7721 Outside Ventilating Fresh Air Intakes

(1) Location.

(a) Outside air intake openings shall be located in distance of at least 20 feet horizontally or 10 feet vertically from vents and chimney outlets.

(b) Where vents and intakes are located on adjacent walls of outside corners, the horizontal distance may be reduced to 10 feet.

(c) Outside air intake openings located in exterior walls shall be located at least 10 feet (measured in any direction) from any exhaust vent or chimney outlet.

(2) Mounting Height.

(a) Outside air intake openings shall be located at least 8 feet above the outside grade or 2 feet above roof. Exemptions of this provision must be approved.

(b) Where outside air intake openings are located in any areaway below grade, the top of the areaway shall be not less than 12 inches above the grade level.

(3) Screens.

All outside air intake openings shall be provided with screening not more than one-half inch nor less than one-fourth inch mesh.

NOTE: See Table 4 for allowable velocities in the design of outside air intake openings.

(4) Weather Protection. All outside air intake openings shall be protected against weather and water with a weather resistant hood or louvers. All outside air intakes, except intakes for combustion air, shall be equipped with a damper to prevent the admission of unheated air to the building when the heating unit is not in operation.

SBC 7722 Combustion Air Intakes

(1) Fuel Inputs Above 500,000 BTU Per Hour.

(a) All boiler rooms and furnace rooms shall be provided with an opening to the outside air. The free area of such opening shall not be less than one square inch for each 5,000 BTU per hour of fuel consumed, except the minimum free area of such opening shall not be less than 100 square inches.

(b) The use of manual operated dampers is not approved.

(c) The use of motorized dampers is approved where the motor is interconnected with the burner(s) of direct-fired equipment which will open the damper, when burner(s) is operating. The burner and damper shall be so inter-connected so that the burner shall not start before the damper is open.

(2) Fuel Inputs Less Than 500,000 BTU Per Hour.

(a) Outside air to the appliance area for proper fuel combustion shall be provided by openings to the outside of the building or to spaces freely communicating to the outside of the building. The openings of ducts supplying such air shall have unobstructed areas not less than the area of the minimum required common flue or flues serving the heating system and other fuel burning appliances in the area, and shall discharge such outside air at a point not more than one foot above the floor.

(b) Air for combustion may be introduced into the return air plenum of a forced air system provided that an unobstructed opening into the appliance area is installed in the supply side of the system. The opening shall have a minimum area of 50% of the common flue area.

(c) When a furnace is installed in a small utility room or other combined space, a sufficient quantity of air must enter the space in which the furnace is located to supply both the air required for combustion and for ventilating the space to prevent it from becoming overheated.

1. Combustion air opening shall be as outlined in part (a) above.

2. Ventilation air shall be supplied to the confined space through two openings to the interior of the building and located as follows:

Ventilation air outlet grille located in the wall or door at a height above the draft hood opening. The free area of the opening shall be ½ square inch for each 1,000 BTU per hour of input.

Ventilation air inlet grille located in the wall or door at or below combustion air inlet to burner. The free area of the opening shall be ½ square inch for each 1,000 BTU per hour of input.

(d) Accessibility and Cleanliness. All outside air intakes shall be constructed and maintained accessible for cleaning. All openings through walls of buildings shall be not less than one foot above the grade level and be protected with screen of not more than ½ inch nor less than ¼ inch mesh.

SBC 7723 Air Cleaning Apparatus. Air Washers and Filters. Contaminated water shall not be recirculated through sprays affecting air used for ventilation purposes.

SBC 7724 Ducts for Residential Application

(1) Duct Construction. The construction of all duct work hereafter installed in connection with any warm air heating system, mechanical ventilation system or air-conditioning system shall be in accordance with the following provisions.

(a) The thickness of sheet metal ductwork shall be in accordance with the gauges listed in Table No. 3.

(b) Materials other than sheet metal may be used for the construction of ductwork when they conform to the requirements of the National Fire Protection Association Standard for the Installation of Residence Type Warm Air Heating and Air Conditioning Systems. NFPA 90B, Sections 121, 181, 182, 183, 184, and 185, Materials for Ducts, and of the Sheet Metal and Air Conditioning Contractors' National Association, Inc. duct manual "Fibrous Glass Construction for Ventilating and Air Conditioning Systems."

(c) No duct smaller than 5 inches in diameter, or corresponding area for rectangular duct of equal friction loss shall be installed except for rooms with less than 75 square feet of ceiling area, or unless otherwise approved by the administrative authority.

(2) Installation Ductwork.

(a) Ducts shall be securely supported by metal hangers, straps, lugs, or brackets. The ducts shall not be used for the support of any other materials or equipment.

TABLE No. 3

METAL THICKNESS OF SHEET METAL DUCTWORK USED FOR RESIDENTIAL PURPOSES

Diameter or Width (inches)	Minimum Thickness Galvanized Iron (U.S. Gauge)	Minimum Thickness Aluminum (B and S Gauge)
	Round Ducts	
Less than 14	30	26
14 or more	28	24
	Rectangular Ducts Enclosed in Partitions	
14 or less	30	26
Over 14	28	24
	Rectangular Ducts Not Enclosed	
14 or less	28	24
Over 14	26	24

(b) No nails shall be driven through the duct walls and no unnecessary holes shall be cut in them.

(c) When it is necessary to install heating supply ducts in outside walls or in unheated spaces, the duct must be effectively insulated against exposure with insulation having a conductivity value (k) of not more than 0.40 (See SBC 7502)

(3) Where return air is taken from first floor through a register box placed between studs, the stud space containing such box shall be effectively sealed to prevent air from stud space above being drawn into the system.

(4) Where return air from upper floors is conducted to the basement through stud spaces any thermal insulation of a flexible type installed in such stud spaces shall be so installed and secured in position as to prevent its encroachment on the open area of said stud spaces due to swelling, buckling, or sagging.

(5) Where the space between joists is used for the purposes of conveyance of return air to the furnace, such joist spaces shall be covered on the bottom of the joists with metal not less than 32 gauge, nailed, or stapled 3 inches on center. A vapor resistant material shall be used for sealing the top of the joist spaces except when sheet plywood is used for sub-flooring.

(6) Return air ducts passing through attached private garages shall be sealed against fumes.

(7) Exposed warm air ducts passing through attached private garages whether heated or not, shall be insulated with incombustible insulation having a conductivity value (k) of 0.40. (See SBC 7502)

(8) Elbows shall be provided with splitters or diffuser vanes where necessary to maintain uniform velocities throughout duct area and reduce turbulence and impact losses. Transformation fittings shall be made with gradual slope. Fan discharge connections shall have a maximum slope of one inch in 7 inches. Where a pipe or other obstruction passes through a duct, a streamlined sleeve of sheet metal shall be installed around such obstruction and shall be soldered to duct at ends to make it air tight. The area of the duct, at point of such obstruction, shall be increased by an amount equal to the streamlined sleeve.

SBC 7725 Ductwork For Other Than Residential Application

(1) Design. All ducts shall be designed to promote the unrestricted flow of air with long sweep or turning vanes.

(2) Air Velocities. For the purpose of calculation and design, the air velocities shall not in general exceed the maximum velocities as recommended in Table 4.

(3) Construction and Installation.

(a) The recommended gauges and construction for rectangular sheet metal ducts and for round and flat oval ducts shall be in accordance to the values recommended in Tables 5, 6, 7 and 8 hereafter. Materials other than sheet metal see SBC 7724(1) (b).

(b) Ducts shall be securely supported by hangers, straps, lugs, or brackets. The ducts shall not be used for the support of any other materials or equipment.

(c) No nails shall be driven through the duct walls and no unnecessary holes shall be cut in them.

TABLE NO. 4—RECOMMENDED AND MAXIMUM DUCT VELOCITIES FOR LOW PRESSURE SYSTEMS

DESIGNATION	VELOCITIES, Fpm					
	Residences		Schools, Theaters, Public Buildings		Industrial Buildings	
	Rec.	Max.	Rec.	Max.	Rec.	Max.
Outdoor Air Intakes*	500	800	500	900	500	1200
Fitlers	250	300	300	350	350	350
Heating Coils	450	500	500	600	600	700
Air Washers	500	500	500	500	500	500
Fan Outlets	1000-1600	1700	1300-2000	1500-2200	1600-2400	1700-2800
Main Ducts	700-900	800-1200	1000-1300	1100-1600	1200-1800	1300-2200
Branch Ducts	600	700-1000	600-900	800-1300	800-1000	1000-1800
Branch Risers	500	650-800	600-700	800-1200	800	1000-1600

*Free Agent.

SBC 7726 Underground Duct Construction and Installation

(1) General Classification. There are two general types of materials which can be used. One type must be completely encased in concrete, and the other need not be completely encased in concrete. Duct materials are classified and described below. The type numbers are arbitrarily chosen and do not indicate in anyway the degree of acceptability of the various types.

(2) No underground duct shall be installed where water conditions may occur unless means are provided to collect and drain surface and underground water by the installation of drain tile around the perimeter of the space served by the underground duct system.

(3) The top of the drain tile shall be at an elevation lower than the bottom of the underground duct.

(4) Types of Ducts.

(a) Type 1 — Material. Ducts constructed of Type 1 material are described as follows:

Ducts which will float when concrete is being poured.

Material which is subject to corrosion by concrete.

Material which is non-combustible. An example of this material is galvanized sheet metal. See Figure 4.

Ducts of this type must be:

encased in not less than 2 inches of concrete and with a minimum of 2½ inches of concrete above the duct;

equivalent in strength and durability to 26-gauge, galvanized-steel round duct of 8-inch diameter.

(b) Type 2 — Material. Ducts constructed of Type 2 materials are described as follows:

Ducts which will float when concrete is being poured.

Ducts constructed of material which is not subject to corrosion by concrete.

Ducts constructed of material which is non-combustible. An example of this material would be stainless steel. See Figure 5. Ducts of this type must provide a minimum of 2½ inch of concrete above the duct.

Be equivalent in strength of 26-gauge, galvanized steel, round duct of 8 inch diameter.

(c) Type 3 — Material. Ducts constructed of Type 3 material are described as follows:

Ducts which will float when concrete is being poured.

Materials which is subject to moisture transmission.

Material which is combustible. An example is laminated paper or other organic fiber. See Figure 5.

Ducts of this material must:

satisfy the requirements set forth in Federal Housing Administration, "Heating and Air Conditioning Ducts Encased and Under Concrete Slabs-or-Ground", Publication 838 of the National Academy of Sciences — National Research Council Washington, D. C. (This criterion and test procedure covers fire resistance, crushing strength, bending strength, deterioration, and odor, delamination, and hydrogenion concentration.)

not be encased in not less than 2 inches of concrete and with a minimum of 2½ inch of concrete above the duct.

not be used within 2 feet of the furnace supply plenum nor within 2 feet of a vertical connection to a riser or register.

(d) Type 4 — Material. Ducts constructed of Type 4 material are described as follows:

Material which is subject to moisture transmission.

Material which is not subject to corrosion by concrete.

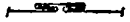
Ducts which will not float when concrete is being poured.

Material which is non-combustible. Examples of this are ceramic pipe having a moisture absorption in excess of 8% and concrete pipe. See Figure 5.

Ducts of this material must be:

covered with not less than 2½ inch of concrete above the duct.

TABLE NO. 5—RECOMMENDED CONSTRUCTION FOR RECTANGULAR LOW PRESSURE[a] DUCTS

Dimension of Longest Side, Inches	Sheet Metal Gage (All Four Sides)[a]			Transverse Reinforcing[c]						
				Between Joints[d]	At Joints[e]					
					 Flat S Slip  Drive Slip	 Standing S Slip		 Standing Seam Joint  Pocket Lock  Alternate Standing S Slip		
	Steel	Aluminum Alloy[b]	Copper	Minimum Reinforcing Angle Size and Maximum Longitudinal Spacing	Min. Gage	Min. Gage	Min. Angle Size	Min. Gage for Pocket Lock or Standing S Slip	Min. Angle Size	Min. Height, Inches
	Gage	Thickness, In.	Oz. Per Sq. Ft.							
Up thru 12	26	0.020	16	None Required	26	24	None Required	24	None Required	1
13-18	24	0.025	24	None Required	24	24	None Required	24	None Required	1
19-30	24	0.025	24	1 × 1 × ⅛ @ 60 in.	—	24	None Required	24	None Required	1
31-42	22	0.032	32	1 × 1 × ⅛ @60 in.	—	22	None Required	22	None Required	1
43-48	22	0.032	32	1½ × 1½f × ⅛ @60 in.	—	22	1½ × 1½ × ⅛	22	None Required	1½
49-54	22	0.032	32	1½ × 1½ × ⅛ @ 48 in.	—	22	1½ × 1½ × ⅛	22	None Required	1½
55-60	20	0.040	36	1½ × 1½ x ⅛ @48 in.	—	22	1½ × 1½ × ⅛	22	None Required	1½
61-84	20	0.040	36	1½ × 1½ × ⅛ @ 24 in.	—	22	1½ × 1½ × ⅛	22	1½ × 1½ × ⅛	1½
85-96	18	0.050	48	1½ × 1½ × ⅛ @ 24 in.	—	22	1½ × 1½ × ⅛	22	1½ × 1½ × ⅛	1½
97-120	18	0.050	48	2 × 2 × ¼ @24 in.	—	22	2 × 2 × ¼	22	2 × 2 × ¼	1½
121 and Over	18	0.050	48	2 × 2 × ¼ @24 in. with tie rods @120 in. along angle	—	—		22	2 × 2 × ¼ with tie rods @120 in. along joint	1½

[a]Flat areas of duct over 18 in. wide shall be stiffened by crossbreaking unless duct will have non-conductive covering or sound absorbing lining.
[b]Suitable aluminum alloys are: Commercial Designation 3003 Temper H14 and Duct Sheet.
[c]Transverse reinforcing size is determined by dimension of side to which angle is applied. Angle sizes are based on mild steel. Reinforcing made in other shapes or of other materials must be of equivalent strength and rigidity.
[d]There is no restriction on the length of duct sections between joints. Ducts are normally made in sections of 4, 8, 10 or 12 ft. in length. The longitudinal spacing of the transverse reinforcing between joints may necessarily be less than the spacing recommended in the table in order to conform to the selected length module.
[e]Other joint types of equivalent strength, rigidity and air tightness may be used.
[f]For aluminum or copper ducts 43 in. through 48 in. maximum dimensions, the maximum longitudinal spacing of transverse reinforcing is 48 in.
[g]Low pressure considered to be 2 in. water static pressure or less.

TABLE NO. 6—RECOMMENDED CONSTRUCTION FOR ROUND DUCTS

Duct Diameter, Inches	Steel—Galv. Sheet Gage				Girth Reinforcing	Girth Joints[a]	
	Low Pressure[b] Ducts and Fittings	Medium and High Pressure Ducts[c]			Minimum Reinforcing Angle Size and Maximum Longitudinal Spacing	(Continuously Welded or as Below)	
		Spiral Lock Seam Duct	Longitudinal Seam Duct	Welded Fittings[e]		Low Pressure Ducts	Medium and High Pressure Ducts
Up thru 8	26	26	24	22	None required	Crimped and beaded joint	2 in. long slip joint
9-13	26	24	22	20	None required	Crimped and beaded joint	4 in. long slip joint
14-22	24	24	22	20	None required	Crimped and beaded joint	4 in. long slip joint
23-36	→	22	20	20	None required	—	4 in. long slip joint
37-50	→	20	20	18	1¼ × 1¼ × ⅛ @72 in.	—	1¼ × 1¼ × ⅛ angle flanged joint
51-60	→	—	18	18	1¼ × 1¼ × ⅛ @72 in.	—	1¼ × 1¼ × ⅛ angle flanged joint
61-84	→	—	16	16	1½ × 1½ × ⅛ @48 in.	—	1½ × 1½ × ⅛ angle flanged joint

[a]Flanged joints may be considered as girth reinforcing. → use next recommended construction.
[b]Low pressure considered to be 2 in. water static pressure or less.
[c]Medium and high pressure considered to be from 2 to 10 in. water static pressure.

TABLE NO. 7—RECOMMENDED CONSTRUCTION FOR RECTANGULAR MEDIUM PRESSURE[a] DUCTS

Dimension of Longest Side, Inches	Galv. Sheet Gage (All Four Sides)	Transverse Reinforcing: Between Joints[b] — Minimum Reinforcing Angle Size and Maximum Longitudinal Spacing: With Tie Rods	Between Joints[b]: Without Tie Rods	At Joints: Inside Slip Joint / Double S Slip / Welded Flange — Min. Angle Size	At Joints: Welded Flange — Min. Height, In.	At Joints: Standing Seam — Min. Height, In.	At Joints: Reinforced Standing Seam — Min. Height, In.	At Joints: Reinforced Standing Seam — Min. Angle Size	At Joints: Flanged Joint — Min. Height, In.	At Joints: Pocket Lock — Min. Height, In.	At Joints: Companion Angle Flanged Joint — Min. Angle Size
Up thru 12	24	No tie rods required	No angle required	None required	M	1	1	None Req'd.	1	1	1¼×1¼×⅛
13–18	24	1 tie rod @ 48 in. intervals on Center-line of duct side	1×1×16 Gage @ 48 in.	1×1×16 Gage	M	1	1	None Req'd.	1	1	1¼×1¼×⅛
19–24	22	1 tie rod @ 48 in. intervals on center-line of duct side	1×1×⅛ @ 48 in.	1×1×⅛	1M	1⅛	1⅛	None Req'd.	1¼	1⅛	1⅛×1⅛×⅛
25–36	22	→	1×1×⅛ @ 32 in. or 1¼×1¼×⅛ @ 40 in.	1¼×1¼×⅛	1⅛ with tie rod in center	1⅛	1⅛	None Req'd.	1½	1½	1¼×1½×⅛
37–48	22	→	1½×1½×⅛ @ 30 in.	1½×1½×⅛	1½ with tie rod in center	2OR1¼ with tie rod in center	1½	1½×1¼×⅛	2	—	1½×1½×⅛

49–60	20	1½×1½×½ @ 24 in. with tie rod in center	2×2×¼ @ 24 in.	2×2×⅛ OR 1½×1½×⅛ with tie rod in center	1⅜ with tie rod in center	1½ with tie rod in center	1½	2×2½	1½ with tie rod in center	—	1½×1½×⅛
61–72	20	1½×1½×⅛ @ 24 in. with tie rod in center	2½×2½×⅝ @ 24 in.	2½×2½×⅝ OR 1½×1¼×¼ with tie rod in center	1M with 2 tie rods	2 with tie rod in center	1½	2½×2½×⅝	1½ with tie rod in center	—	2×2×⅛ OR 1¼×1¼×⅛ with tie rod in center
73–84	18	1½×1½×¼ @ 24 in. with tie rod in center	2½×2½×⅝ @ 24 in.	2½×2½×⅝ OR 1½×1½×⅛ with tie rod in center	1M with 2 tie rods	2 with tie rod in center	1½	2½×2½×M	1½ with tie	—	2×2×⅛ OR 1¼×1¼×⅛ with tie rod in center
85–96	18	1½×1½×¼ @ 24 in. with tie rod in center	←	1½×1½×⅛ with tie rod in center	1M with 2 tie rods	2 with tie rod in center		←	1½ with tie rod in center	—	2×2×⅛ OR 1¼×1¼×⅛ tie rod in in center
97 and Over	18	2×2×¼ @ 24 in. with tie rods @48 in. along angle	←	2×2×⅛ with tie rods @ 48 in. along angle	1M with tie rods @ 32 in. along joint	2 with tie rods @ 48 in. along joint		←	2 with tie rods @48 in. along joint	—	1¼×1¼×⅛ with tie rods @ 48 in. along angle

→ Use next recommended construction.

[a]Transverse reinforcing must be applied on all four sides and tied together at each corner by riveting, bolting or welding. *Transverse reinforcing size is determined by dimension of side to which angle is applied. Angle sizes are based on mild steel. Reinforcing made in other shapes or of other materials must be of equivalent strength and rigidity.*

[b]There is no restriction on the length of duct sections between joints. Ducts are normally made in sections of 4, 8, 10, or 12 ft. in length. The longitudinal spacing of the transverse reinforcing between joints may necessarily be less than the spacing recommended in the table in order to conform to the selected length module.

[c]Medium pressure considered to be 2 to 6 in. water static pressure.

TABLE NO. 8—RECOMMENDED CONSTRUCTION FOR RECTANGULAR HIGH PRESSURE DUCTS[a]

Dimension of Longest Side, Inches	Galv. Sheet Gage (All Four Sides)	Transverse Reinforcings[a]								
		Between Joints[b]		At Joints						
		Minimum Reinforcing Angle Size and Maximum Longitudinal Spacing		Inside Slip Joint / Double S Slip / Welded Flange	Welded Flange	Standing Seam	Reinforced Standing Seam		Flanged Joint	Companion Angle Flanged Joint
		With Tie Rods	Without Tie Rods	Min. Angle Size	Min. Height, In.	Min Height, In.	Min. Height, In.	Min. Angle Size	Min. Height, In.	Min. Angle Size
Up thru 12	22	No tie rods required	No angle required	None required	M	1	1	None Required	1	1¼×1¼×⅛
13–18	22	1 tie rod @40 in. intervals on center-line of duct side	1×1×16 Gage @ 48 in.	1×1×16 Gage	M	1	1	None Required	1	1¼×1¼×⅛
19–24	22	2 tie rods @ 40 in.	1×1×⅛ @48 in.	1×1×⅛	1M	1¼	1¼	None Required	1M	1¼×1¼×⅛
25–36	22	→	1¼×1¼×⅛ @ 32 in. OR 1½×1½×⅛ @ 40 in.	1½×1½×¼	1⅛ with tie rod in center	2 OR 1½ with tie rod in center	1½	1½×1½×⅛	2	1M×1M×M
37–48	22	→	2×2×¼ @ 30 in.	2×2×¼ OR 1½×1½×⅛ with tie rod in center	1¾ with tie rod in center	1½ with tie rod in center	1½	2×2×M	1½ with tie rod in center	1½×1M×M

49–60	20	1¼×1½×¼ @ 24 in. with tie rod center	2×2×⅝ @24 in.	2×2×⅝ OR 1½×1½×⅛ with tie rod in center	1¼ with 2 tie rods	1½ with tie rod in center	1½	2×2×¼	1½ with tie rod in center	2×2×¼ OR 1½×1½×⅛ with tie rod in center
61–72	20	1½×1½×⅛ @ 24 in. with tie rod in center	2½×2½×⅝ @ 24 in.	2½×2½×⅝ OR 1¼×1¼×⅛ with tie rod in center	1¼ with tie rods	2 with tie rod in center	1½	2¼×2¼×M	1¼ with tie rod in center	2×2×⅝ OR 1¼×1¼×¼ with tie rod in center
73–84	18	1½×1½×¼ @ 2½ in. with tie rod in center	←	1½×1½×⅛ with tie rod in center	1¼ with 2 tie rods	2 with tie rod in center	←		2 with tie rod in center	1¼×1¼×¾ with tie rod in center
85–96	18	1½×1½×⅛ @ 24 in. with tie rod in center	←	1½×1½×¼ with tie rod in center	1¾ with 2 tie rods	2 with tie rod in center	←		2 with tie rod in center	1¼×1¼×¼ with tie rod in center
97 & Over	16	2×2×⅛ @ 24 in. with tie rods @ 48 in. along angle	←	2×2×⅛ with tie rods @ 48 in. along angle	1¼ with tie rods @ 32 in. along joint	2 with tie rods @ 48 in. along joint	←		2 with tie rods @ 48 in. along joint	1⅛×1⅛×¼ with tie rods @ 48 in. along angle

[a]Transverse reinforcing must be applied on all four sides and tied together at each corner be riveting, bolting or welding. Transverse reinforcing size is determined by dimension of side to which angle is applied. Angle sizes are based on mild steel. Reinforcing made in other shapes or of other materials must be of equivalent strength and rigidity.

[b]There is no restriction on the length of duct sections between joints. Ducts are normally made in sections of 4, 8, 10, or 12 ft. in length. The longitudinal spacing of the transverse reinforcing between joints may necessarily be less than the spacings recommended in the table in order to conform to the selected length module.

[c]High pressure considered to be 6 to 10 in. water static pressure.

→ Use next recommended construction.

equivalent in strength and durability to 26-gauge galvanized steel, round duct of 8 inch diameter.

(c) Type 5 — Material. Ducts constructed of Type 5 material are described as follows:

Material which is not subject to moisture transmission.

Material which is not subject to corrosion by concrete.

Ducts which will not float when concrete is being poured.

Material which is non-combustible. Examples of this are asbestos-cement pipe and ceramic pipe, but fired to a moisture absorption not to exceed 8%, and trademarked by its manufacturer for identification. See Figure 6.

Ducts of this material must be:

equivalent in strength and durability to 26-gauge galvanized-steel, round duct of 8-inch diameter.

installed so that there is a minimum of 2½ inch of concrete above the duct, but need not be completely encased in concrete. (Where bell and spigot joints are used, there must be a minimum of 2 inch of concrete above the bell.)

figure 9 shows construction details for the above-named types of materials.

(f) All ducts which tend to float, Types 1, 2, and 3, should be securely held in place when the slab is poured.

The ducts must be brought to the proper level and pitch by placing concrete or other suitable materials under them at 8-foot intervals for support.

They must be anchored to prevent floating. This can be accomplished by either one of the two following methods:

placing shovelsful of concrete at 8-foot intervals on the vapor barrier and under the ducts. Wires shall be embedded in the concrete at these intervals and then wrapped around the ducts after the concrete has hardened. See Figure 7.

by making a preliminary pour of concrete around the bottom of the ducts, holding them in place with suitable weights or blocking and completing the operation after the first pour has set sufficiently to hold the ducts in place. See Figure 8.

(5) Vapor Barrier.

(a) Residential Installations.

A vapor barrier must be placed between the fill and the bottom of the slab as shown in Figures 4, 5, 6, 7 and 8.

The barrier shall be polyethylene, 4 mil. in thickness or equal.

It must completely cover the area within the foundation walls and extend up the walls to the top of the foundation.

All joints must be lapped 4 inches to 6 inches and prefereably sealed with a suitable material.

Whenever the vapor barrier is pierced by tie-rods, utility pipes, etc., the hole must be sealed.

(b) Other Installations.

If duct only is encased, it should be done in accordance with (a) second and fourth paragraphs above.

Not required when duct material is both vapor resistant and non-corrosive.

(6) Floor Slab Insulation.

(a) Insulation must be placed completely around the edge of the slab when less than 42 inches below finish grade.

(b) A minimum recommendation is that the insulation material should have a conductance at 70 degree F. of not more than .40 BTU per hour per square foot per degree F. temperature difference.

(c) The material shall be moisture-proof, vermin and insect proof, and resistant to deterioration.

(d) If installed vertically on the inside surface of the footing wall, it should extend downward not less than 18 inches from the top of the slab. See Figures 8 and 9.

(7) Underground ducts shall be provided with free drainage to a lower room of the building or to a sump to provide natural drainage of the ducts. Access openings shall be provided for inspection and cleaning service at each low point of the system. All such ducts shall be constructed without a direct sewer connection.

(8) All room inlets and outlets for underground ducts shall have reasonably watertight connections where the risers are connected to underground ducts.

(a) Where supply air ducts are installed parallel and adjacent to an outside wall, a moisture-proof insulating material shall be provided having a thermal conductance factor of 125 BTU per hour per square foot per degree F. and extending from bottom of floor to 2 feet below finished grade.

(b) The insulation shall be a cellular block-type with the cell linkage providing a vapor seal. The material shall withstand a sustained minimum pressure of 5 pounds per square inch.

(9) Pipes carrying non-hazardous material may be installed in underground ducts, provided that the net free area is sufficient for the flow of air and the inside dimensions of the duct are greater than 4 feet wide and 4 feet high.

SBC 7727 Suspended Ceiling Plenum. When the void above suspended ceiling is used as a supply or return air plenum, pipes carrying hazardous materials shall not be installed in the plenum unless the pipes are sleeved and the sleeve ventilated by gravity to the outside. The plenum shall be of incombustible construction. Any openings to this space not connected to the duct system that would affect the fire-resistive rating of the roof and ceiling construction are prohibited.

SBC 7728 Insulation of Ducts.

(1) Where air conditioning supply ducts are exposed in a manner which creates a temperature drop of more than 10% for heating and a temperature rise of 4% on cooling from the plenum temperature, the duct shall be insulated to meet this requirement.

UNDERGROUND DUCT CONSTRUCTION

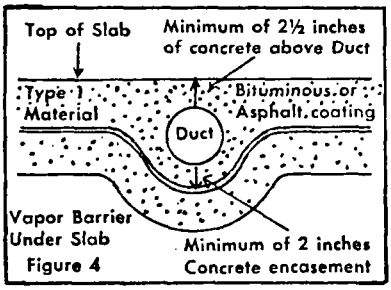


Figure 4

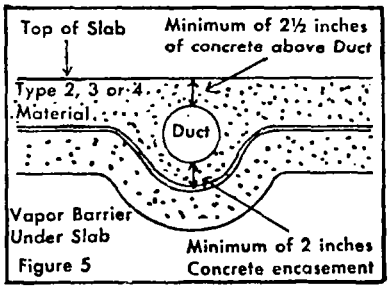


Figure 5

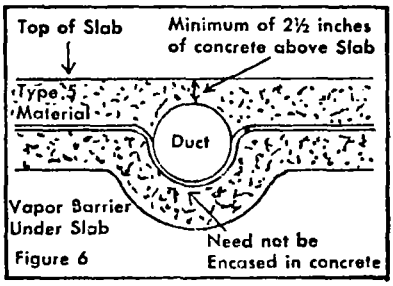


Figure 6

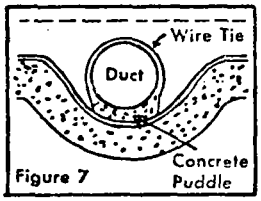


Figure 7

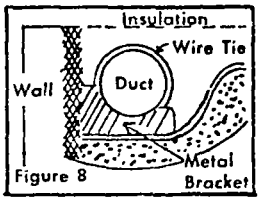


Figure 8

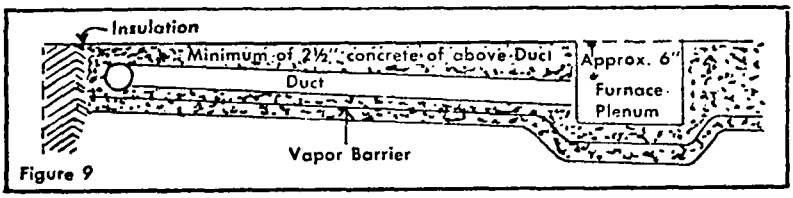


Figure 9

(2) The temperature drop considered shall be from the plenum to the furthest register.

SBC 7729 Separate Vent Ducts

(1) Separate exhaust systems shall be provided for kitchen and bathroom exhaust. Exhaust vent ducts, serving similar occupancies, shall be continuous to a gathering chamber immediately below the point of final delivery to the outside atmosphere, such as the basin of a roof ventilator.

(2) This requirement prohibits the use of open pipe spaces as a substitute for a continuous duct.

SBC 7730 Vent Ducts, Horizontal Run

(1) Horizontal runs in vent ducts connected to siphon-type roof ventilators shall be avoided wherever possible and the maximum practicable inclination shall be provided in all cases. In no case shall the horizontal run exceed 30% of the vertical run unless the room has a direct mechanical supply or the vent duct is connected to an exhaust fan.

(2) Where the interior spaces are subject to pressure changes, an automatic back draft damper shall be provided. Hand operated dampers shall not be installed in vent ducts that are connected to a siphon-type roof ventilator.

SBC 7731 Vent Ducts Above Roof

(1) Final delivery of all vent circuits shall be protected from the weather and shall be located and constructed to prevent contamination of air supply for or in any occupied area.

(2) Gravity vent ducts shall extend not less than 2 feet above the high portion of the roof or parapet wall, and shall be surmounted with an approved type of siphon-roof ventilator.

(3) A drip pan shall be provided below all gravity vents.

SBC 7732 Relief Vents

(1) Barometric relief vents may not be used in lieu of siphon ventilators where ventilation is required by the exhaust method for occupancies classified as (3) and (4) in Table 1, SBC 7705.

(2) Barometric relief vents may be used to exhaust an air volume equal to the mechanical ventilation supplied for occupancies classified as (1) and (2) in Table 1, Section SBC 7705.

(3) Where barometric relief vents are installed on the roof, the discharge opening shall not be less than 2 feet above the high portion of the roof.

SBC 7733 Volume Dampers and Deflectors. Necessary volume dampers, splitters, and deflectors shall be provided for all ducts to permit accurate balancing of the system, and such dampers, splitters, and deflectors shall be set according to air measurements of the system and shall be locked in place.

SBC 7734 Outlets and Returns

(1) Number and Arrangement. The capacity, number, and arrangement of supply outlets, returns, and exhausts shall be such as to insure a reason-

ably uniform distribution of air throughout the areas served during all periods of occupancy.

(2) Elevator Shafts and Stairwells. Elevator shafts and stairwells shall not be used for ventilation purposes nor shall they be permitted to interfere with the effectiveness of the installation, except where there is a change in elevations and doors are not provided or are not required to separate the stairwell or elevator shaft from other areas.

(3) Outlets and Returns for Gravity Systems. Gravity outlets and returns shall be arranged in a manner which utilizes every possible natural advantage to provide proper and effective air movement and distribution.

(4) Grilles or Diffusers Required. All air supply outlets and returns shall be equipped with grilles or devices which will provide a reasonably uniform distribution of air.

(5) Floor Registers. Shall be specifically designed for this use.

(6) Corridor Ventilation. Air from occupied areas uncontaminated by other than human occupancy may be discharged into corridors and recirculated or vented through auxiliary spaces, such as built-in lockers, toilet rooms, kitchens, or similar areas. Where the vent capacity of such auxiliary spaces is insufficient, additional direct vent flues shall be provided.

(a) Where lockers installed in recessed walls are used for venting purposes, each inlet and outlet shall have a net free area of not less than 15 square inches per lineal foot of locker width.

SBC 7735 Paint Spray Areas

(1) Paint spray areas shall comply with the construction, mechanical ventilation, make up air, and flammable liquid storage standards set forth in the American Standard Safety Code for the "Design, Construction, and Ventilation of Spray Finishing Operations" (Z 9.3) published by America National Standards Institute.

SBC 7736 Fire Dampers in Ducts Passing Through Fire Separation. Wherever ducts pass through fire walls or connect two fire areas of a building, automatic fire dampers shall be provided. The design of such dampers and other fire protective details shall be in accordance with the requirements of Chapter 85 — Fire Control.

SBC 7801 REFRIGERATION. General Requirements. The application of this Chapter of the Minnesota Heating, Ventilating, Air Conditioning and Refrigeration Code is intended to provide for the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which is vaporized and is normally liquified in its refrigeration cycle when employed under the occupancy classifications in SBC 7805.

SBC 7802 Limitation. The provisions of this Code are not intended to apply to the use of water, or air as a refrigerant nor to refrigerating systems installed on railroad cars, motor vehicles, motor drawn vehicles or on shipboard, nor shall apply to:

(1) A domestic installation, alteration, maintenance and repair of a refrigerator or freezer having a cabinet volume of 25 cubic feet or less.

(2) One or two family dwellings served by one condensing unit where the combined gross cubic foot volume of both cabinets is 40 cubic feet or less.

(3) Any unit system, one-half horsepower or less.

(4) A domestic installation, alteration, maintenance and repair of a single unit plug-in type air or room conditioner.

SBC 7803 Refrigerants, Unauthorized Use. No refrigerating system shall be maintained or operated which employs a refrigerant other than is specified in the American Standard Safety Code of Mechanical Refrigeration ANSI B9.1 unless approved by the Administrative Authority.

SBC 7804 Definitions. For the purpose of this Chapter, the following definitions shall apply.

ABSORBER (ADSORBER) is that part of the low side of an absorption system used for absorbing (adsorbing) vapor refrigerant.

ABSORPTION SYSTEM is a refrigerating system in which the gas evolved in the evaporator is taken up by an absorber or adsorber.

BRAZED JOINT, for the purpose of this Code, is a gas-tight joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 1000° F. but less than the melting temperatures of the joined parts.

BRINE is any liquid, used for the transmission of heat without a change in its state, having no flash point or a flash point above 150° F.

CENTRIFUGAL COMPRESSOR is a non-positive displacement compressor which depends at least in part on centrifugal force for pressure use.

COMPANION OR BLOCK VALVES are pairs of mating stop valves, valving off sections of systems and arranged so that these sections may be joined before opening these valves or separated after closing them.

COMPRESSOR is a specific machine, with or without accessories, for compressing a given refrigerant vapor.

COMPRESSOR UNIT is a condensing unit less the condenser and liquid receiver.

CONDENSER is a vessel or arrangement of pipe or tubing in which vaporized refrigerant is liquified by the removal of heat.

CONDENSING UNIT is a specific refrigerating machine combination for a given refrigerant, consisting of one or more power-driven compressors, condensers, liquid receivers (when required), and the regularly furnished accessories.

CONTAINER is a cylinder for the transportation of refrigerant.

COOLING TOWER is a fixture or structure used to cool water by vaporizing some of the water into the atmosphere.

DIRECT SYSTEM — See Section SBC 7806(2).

DOUBLE INDIRECT VENTED OPEN-SPRAY SYSTEM — See Section SBC 7806(3) (d).

DOUBLE (OR SECONDARY) REFRIGERANT SYSTEM — See Section SBC 7806(4).

EVAPORATOR is that part of the system in which liquid refrigerant is vaporized to produce refrigeration.

EXPANSION COIL is an evaporator constructed of pipe or tubing.

FUSIBLE PLUG is a device having a predetermined-temperature fusible member for the relief of pressure.

GENERATOR is any device equipped with a heating element used in the refrigerating system to increase the pressure of refrigerant in its gas or vapor state for the purpose of liquifying the refrigerant.

HIGH SIDE means the parts of a refrigerating system under condensed pressure.

INDIRECT CLOSED-SURFACE SYSTEM — See SBC 7806(3) (b).

INDIRECT OPEN-SPRAY SYSTEM — See SBC 7806(3) (d).

INDIRECT SYSTEM — See SBC 7806(3).

INDIRECT VENTED CLOSED-SURFACE SYSTEM — See SBC 7806 (3) (g).

INTERNAL GROSS VOLUME is the volume as determined from internal dimensions of the container with no allowance for volume of internal parts.

LIMITED CHARGED SYSTEM is a system in which, with the compressor idle, the internal volume and total refrigerant charge are such that the design working pressure will not be exceeded by complete evaporation of the refrigerant charge.

LIQUID RECEIVER is a vessel permanently connected to a system by inlet and outlet pipes for storage of a liquid refrigerant.

LOW SIDE means the parts of a refrigerating system under evaporator pressure.

MACHINERY is the refrigerating equipment forming a part of the refrigerating system including any or all of the following: compressor, condenser, generator, absorber (adsorber), liquid receiver, connecting pipe, or evaporator.

MACHINERY ROOM as required by SBC 7808, is a room in which a refrigerating system is permanently installed and operated but not including evaporators located in a cold storage room, refrigerator box, air cooled space, or other enclosed space. Closets solely contained within, and opening only into, a room shall not be considered machinery rooms but shall be considered a part of the machinery room in which they are contained or open into. It is not the intent of this definition to cause the space in which a self-contained system is located to be classified as a machinery room.

MACHINERY ROOM, CLASS T as required by Section SBC 7808, is a room having machinery but no flame-producing apparatus permanently installed and operated and also conforming to the following:

(a) Any doors, communicating with the building, shall be approved self-closing, tight-fitting fire doors.

(b) Walls, floor, and ceiling shall be tight and of not less than one-hour fire-resistive construction.

(c) It shall have an exit door which opens directly to the outer air or through a vestibule-type exit equipped with self-closing, tight-fitting doors.

(d) Exterior openings, if present, shall not be under any fire escape or any open stairway.

(e) All pipes piercing the interior walls, ceiling, or floor of such room shall be tightly sealed to the walls, ceiling, or floor through which they pass.

(f) Emergency remote controls to stop the action of the refrigerant compressor shall be provided and located immediately outside the machinery room.

(g) An independent mechanical ventilation system shall be provided.

(h) Emergency remote controls for the mechanical means of ventilation shall be provided and located outside the machinery room.

MANIFOLD or HEADER is a pipe or tube into which one or more refrigerant-containing lines are connected.

MECHANICAL JOINT, for the purpose of this Code, is a gas-tight joint, obtained by the joining of metal parts through a positive-holding mechanical construction.

NONPOSITIVE DISPLACEMENT COMPRESSOR is a compressor in which increase in vapor pressure is attained without changing the internal volume of the compression chamber.

PIPING means the pipe or tube mains for inter-connecting the various parts of a refrigerating system.

POSITIVE DISPLACEMENT COMPRESSOR is a compressor in which increase in vapor pressure is attained by changing the internal volume of the compression chamber.

PRESSURE-IMPOSING ELEMENT is any device or portion of the equipment used for the purpose of increasing the refrigerant vapor pressure.

PRESSURE-LIMITING DEVICE is a pressure-responsive mechanism designed to automatically stop the operation of the pressure imposing element at a predetermined pressure.

PRESSURE-RELIEF DEVICE is a pressure-actuated valve or rupture member designed to automatically relieve excessive pressure.

PRESSURE-RELIEF VALVE is a pressure-actuated valve held closed by a spring or other means and designed to automatically relieve pressure in excess of its setting.

PRESSURE VESSEL is any refrigerant-containing receptacle of a refrigerating system, other than evaporators (each separate section of which does not exceed ½ cubic foot of refrigerant-containing volume), expansion coils, compressors, controls, headers, pipe, and pipe fittings.

RECIPROCATING COMPRESSOR is a positive displacement compressor with a piston or pistons moving in a straight line, but alternately in opposite directions.

REFRIGERANT is a substance used to produce refrigeration by its expansion or vaporization.

REFRIGERATING SYSTEM is a combination of inter-connected refrigerant-containing parts constituting one closed refrigerant circuit in which a refrigerant is circulated for the purpose of extracting heat.

(a) ABSORPTION SYSTEM is a refrigerating system in which the gas evolved in the evaporator is taken up by an absorber or adsorber.

(b) SEALED ABSORPTION SYSTEM is a unit system for Group 2 refrigerants only in which all refrigerant-containing parts are made permanently tight by welding or brazing against refrigerant loss.

(c) SELF-CONTAINED SYSTEM is a complete factory-made and factory-tested system is a suitable frame or enclosure which is fabricated and shipped in one or more sections and in which no refrigerant-containing parts are connected in the field other than by companion or block valves.

(d) UNIT SYSTEM is a self-contained system which has been assembled and tested prior to its installation and which is installed without connecting any refrigerant-containing parts. A unit system may include factory-assembled companion or block valves.

RUPTURE MEMBER is a device that will rupture at a predetermined pressure.

SOLDERED JOINT, for the purpose of this Code, is a gas-tight joint obtained by the joining of metal parts with metallic mixtures or alloys which melt at temperatures below 1000° F. and above 400° F.

STOP VALVE is a shut-off for controlling the flow of refrigerant.

WELDED JOINT, for the purpose of this Code, is a gas-tight joint, obtained by the joining of metal parts in the plastic or molten state.

SBC 7805 Building Occupancy Classification.

(1) Locations governed by this Code in which refrigerating systems may be placed are grouped by occupancy as follows:

(a) Institutional Occupancy shall apply to that portion of the premises in which persons are confined to receive medical, charitable, educational, or other care or treatment, or in which persons are held or detained by reason of public or civic duty, including among others, hospitals, asylums,

sanitariums, police stations, jails, court houses with cells, and similar occupancies.

(b) Public Assembly Occupancy shall apply to that portion of the premises in which persons congregate for civic, political, educational, religious, social, or recreational purposes; including among others, armories, assembly rooms, auditoriums, ballrooms, bath houses, bus terminals, broadcasting studios, churches, colleges, court houses without cells, dance halls, department stores, exhibition halls, fraternity halls, libraries, lodge rooms, mortuary chapels, museums, passenger depots, schools, skating rinks, subway stations, theaters, and similar occupancies.

(c) Residential Occupancy shall apply to that portion of the premises in which sleeping accommodations are provided, including among others, club houses, convents, dormitories, hotels, lodging houses, multiple story apartments, residences, studios, tenements, and similar occupancies.

(d) Commercial Occupancy shall apply to that portion of the premises used for the transaction of business; for the rendering of professional services; the supplying of food, drink, or other bodily needs and comforts; for manufacturing purposes or for the performance of work or labor (except as included under (e) Industrial Occupancy) including among others, bake shops, fur storage, laboratories, loft buildings, markets, office buildings, professional buildings, restaurants, stores other than department stores, and similar occupancies.

(e) Industrial Occupancy shall apply to an entire building or premises or to that portion of a building used for manufacturing, processing, or storage of materials or products, including among others, chemical, food, candy and ice cream factories, ice making plants, meat packing plants, refineries, perishable food warehouses and similar occupancies, provided the entire building is occupied by a single tenant.

(f) Mixed Occupancy shall apply to a building occupied or used for different purposes in different parts. When the occupancies are cut off from the rest of the building by tight partitions, floors, and ceilings and protected by self-closing doors, the requirements of each type of occupancy shall apply for its portion of the building or premises. For example, the cold storage spaces in retail frozen food lockers, hotels, and department stores in buildings occupied by a single tenant might be classified under Industrial Occupancy, whereas other portions of the building would be classified under other occupancies. When the occupancies are not so separated, the occupancy carrying the more stringent requirements shall govern.

(2) Adjacent Locations. Equipment installed in locations to areas outlined in (1) (a) through (1) (f), including outdoor installations, shall be governed by the applicable requirements of this Code.

SBC 7806 Refrigerating System — Classification by Type

(1) Refrigerating Systems shall be divided into classes, descriptive of the method employed for extracting heat as follows in (2) to (4), inclusive. The direct, indirect and double refrigerant systems are illustrated in Figures 1 and 2.

(2) Direct System is one in which the evaporator is in direct contact with the material or space refrigerated or is located in air-circulating passages communicating with such spaces.

(3) Indirect System is one in which a liquid, such as brine or water, cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air so circulated. Indirect ssytems which are distinguished by the type or method of application are as given in the following paragraphs:

(a) Indirect Open-Spray System is one in which a liquid, such as brine or water, cooled by an evaporator located in an enclosure external to a cooling chamber, is circulated to such cooling chamber and is sprayed therein.

(b) Indirect Closed-Surface System is one in which a liquid such as brine or water, cooled by an evaporator located in an enclosure external to a cooling chamber, is circulated to and through such a cooling chamber in pipes or other closed circuits.

(c) Indirect Vented Closed-Surface System is one in which a liquid, such as brine or water, cooled by an evaporator located in a vented enclosure external to a cooling chamber, is circulated to and through such cooling chamber in pipes or other closed circuits.

(d) Double Indirect Vented Open-Spray System is one in which a liquid, such as brine or water, cooled by an evaporator located in a vented enclosure, is circulated through a closed circuit to a second enclosure where it cools another supply of a liquid, such as brine or water, and this liquid in turn is circulated to a cooling chamber and is sprayed therein.

(4) Double (or Secondary) Refrigerant System is one in which an evaporative refrigerant is used in a secondary circuit. For the purpose of this Code, each system enclosing a separate body of an evaporative refrigerant shall be considered as a separate direct system.

SBC 7806 Refrigerant Classification

(1) General. The Numerical Refrigerant Designation is from ASHRAE Standard 34 (American Standard B79.1). Refrigerants are, for the purpose of this Code, divided into groups as follows:

(a) Group 1

Carbon dioxide (Refrigerant 744)..... CO_2
Dichlorodifluromethane (Refrigerant 12)..... CCl_2F_2
Dichloridifluromethane, 73.8% ..... CCl_2F_2
and Ethylidene Fluoride, 26.2% (Refrigerant 500)..... CH_3CHF_2
Dichloromethane (Methylene chloride) (Refrigerant 30).... CH_2Cl_2
Dichloromonofluoromethane (Refrigerant 21)..... $CHCl_2F$
Dichlorotetrafluoroethane (Refrigerant 114)..... $C_2Cl_2F_4$
Monobromotrifluromethane (Refrigerant 13B1)..... $CBrF_3$
Monochlorodifluromethane (Refrigerant 22)..... $CHClF_2$
Monochlorodifluromethane, 48.8% ..... $CHClF_2$
and Monochloropenta-fluoroethane, 51.2% (Refrigerant 502) ..... $CClF_2CF_3$
Monochlorotrifluoromethane (Refrigerant 13)..... $CClF_3$
Octafluorocyclobutane (Refrigerant C318)..... C_4F_8
Trichloromonofluoromethane (Refrigerant 11)..... CCl_3F
Trichlorotrifluoroethane (Refrigerant 113)..... $C_2Cl_3F_3$

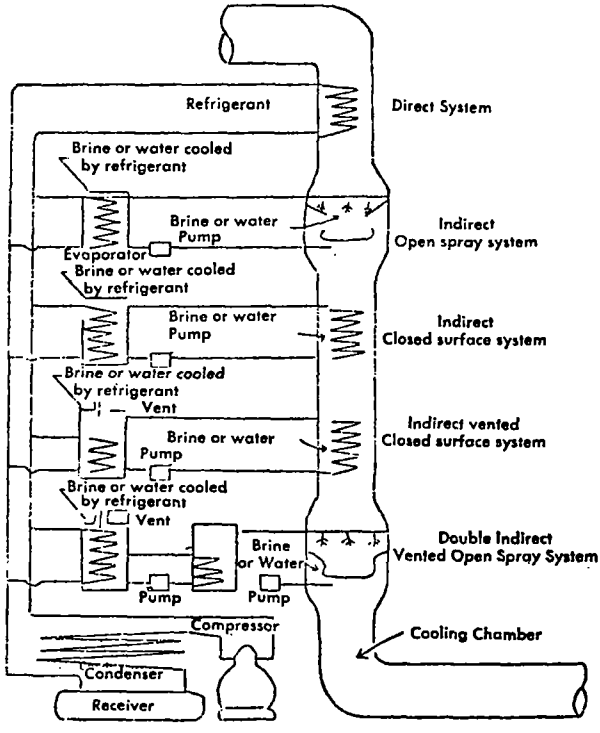


Fig. 1

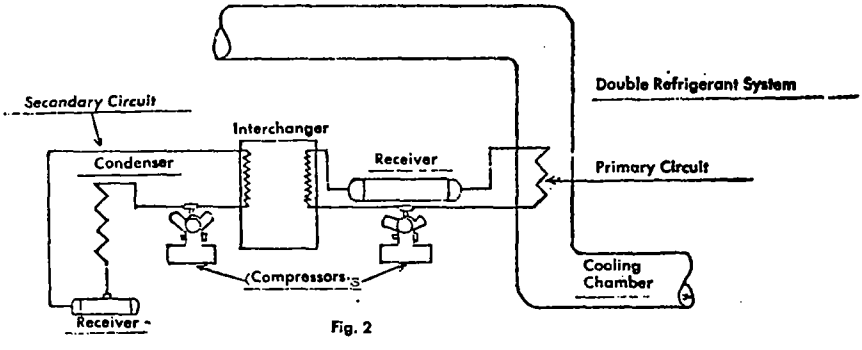


Fig. 2

(b) Group 2

Ammonia ..... NH_3
Dichloroethylene ..... $C_2H_2Cl_2$
Ethyl chloride ..... C_2H_5Cl
Methyl chloride ..... CH_3Cl
Methyl formate ..... $HCOOCH_3$
Sulphur dioxide ..... SO_2

(c) Group 3

Butane ..... C_4H_{10}
Ethane ..... C_2H_6
Ethylene ..... C_2H_4
Isobutane ..... $(CH_3)_3CH$
Propane ..... C_3H_8

SBC 7807 Requirements for Institutional, Public Assembly, Residential, and Commercial Occupancies

(1) General.

(a) Public Stairway, Stair Landing, Entrance or Exit. No refrigerating system shall be installed in or on a public stairway, stair landing, entrance, or exit.

(b) Public Hallway or Lobby. No refrigerating system shall interfere with free passage. No Group 2 refrigerant shall be permitted in public hallways or lobbies of Institutional or Public Assembly Occupancies. Refrigerating systems installed in a public hallway or lobby shall be limited to:

(1) Unit Systems containing not more than the quantities of a Group 1 refrigerant specified in Table 1, or

(2) Sealed Absorption Systems containing not more than 3 pounds of Group 2 refrigerant when in Residential and Commercial Occupancies.

(c) Refrigerant Piping Through Floors. Refrigerant piping shall not be carried through floors except as follows:

(1) It may be carried from the basement to the first floor or from the top floor to a machinery penthouse or to the roof.

(2) For the purpose of connecting to a condenser on the roof, it may be carried through an approved, rigid and tight continuous fire-resisting pipe duct or shaft having no openings on intermediate floors, or it may be carried on the outer wall of the building provided it is not located in an air shaft, closed court, or in other similar open spaces enclosed within the outer walls of the building.

(3) In systems containing Group 1 refrigerants, the refrigerant piping may also be carried in or through floors, intermediate between the first floor and the top floor, provided it is enclosed in an approved, rigid and tight continuous fire-resisting pipe duct or shaft where it passes through intermediate spaces not served by the system. Piping of direct systems, as governed by SBC 7807(2) (a), need not be enclosed where it passes through space served by that system. The pipe duct or shaft shall be vented to the outside or to a space served by the system.

TABLE No. 1

MAXIMUM PERMISSIBLE QUANTITIES OF GROUP 1 REFRIGERANTS FOR DIRECT SYSTEMS

Refrigerant name and number**	Chemical formula	Max. quant. in lb. per 1000 cu. ft. of humanly occup. space
Carbon dioxide (Refrigerant 744)	CO_2	11
Dichlorodifluoromethane (Refrigerant 12)	CCl_2F_2	31
Dichlorodifluoromethane, 73.8% and Ethylidene Fluoride, 26.2% (Refrigerant 500)	CCl_2F_2 / CH_3CHF_2	26
Dichloromethane (Methylene chloride) (Refrigerant 30)	CH_2Cl_2	6
Dichloromonofluoromethane (Refrigerant 21)	$CHCl_2F$	13
Dicholortetrafluoromethane (Refrigerant 114)	$C_2Cl_2F_4$	44
Monobromotrifluoromethane (Refrigerant 13B1)	$CBrF_3$	38
Monochlorodifluoromethane (Refrigerant 22)	$CHClF_2$	22
Monochlorodifluoromethane, 48.8% and Monochloropentafluoroethane, 51.2% (Refrigerant 502)	$CHClF_2$ / $CClF_2CF$	30
Monochlorotrifluoromethane (Refrigerant 13)	$CClF_3$	27
Octafluorocyclobutane (Refrigerant C318)	C_4F_8	50
Trichloromonofluoromethane (Refrigerant 11)	CCl_3F	35
Trichlorotrifluoroethane (Refrigerant 113)	$C_2Cl_3F_3$	24

*Volatile charge in a control shall not be considered as refrigerant.
**ASHRAE Designation (See SBC 7806)

(2) Group 1 Refrigerants

(a) Direct Systems. The maximum permissible quantity of a Group 1 refrigerant in a direct system as specified in Table 1 except Institutional Occupancies where further limited by SBC 7807(2) (a) (1).

(1) Direct Systems in Institutional Occupancies shall be limited to unit systems each containing not more than 20 pounds of Group 1 refrigerants except in kitchens, laboratories, and mortuaries. (See SBC 7807(2) (d).

(2) When the refrigerant-containing parts of a system are located in one or more enclosed spaces, the cubical content of the smallest enclosed humanly occupied space other than the machinery room, shall be used to determine the permissible quantity of refrigerant in the system. Where a refrigerating system has evaporator coils serving individual stories of a building, the story having the smallest volume shall be used to determine the maximum quantity of refrigerant in the entire system.

(3) When the evaporator is located in an air duct system, cubical content of the smallest enclosed humanly occupied space served by the air duct system shall be used to determine the permissible quantity of refrigerant in the system; however, if the air flow to any enclosed space served by the air duct system cannot be shut off or reduced below one-quarter of its maximum, the cubical contents of the entire space served by the air duct

system may be used to determine the permissible quantity of refrigerant in the system.

(4) In Institutional and Public Assembly Occupancies, direct expansion coils or evaporators used for air conditioning and located downstream from, and in proximity to, a heating coil, or located upstream within 18 inches of a heating coil, shall be fitted with a pressure relief device discharging to the outside of the building in an approved manner; except that such a relief device shall not be required on unit or self-contained systems if the internal volume of the low side of the system which may be shut off by valves, divided by the total weight of refrigerant in the system less the weight of refrigerant vapor contained in the other parts of the system at 110° F., exceeds the specific volume of the refrigerant at critical conditions of temperature and pressure.

(Note: The above exemption is also stated in formula form below.)

$$\frac{V_1}{W_1 - W_2} \text{ shall be more than } V_{sp}$$

Where

V_1=low side volume, cu. ft.

V_{sp}=specific volume at critical conditions of temperature and pressure, cu. ft. per lb.

W_1=total weight of refrigerant in system, lb.

W_2=weight of refrigerant vapor (lb.) at 110° F. in V_2,

$\frac{V_2}{}$

=specific volume of refrigerant, in cu. ft. per lb., at 110° F., where V_2=total volume of system less V_1 cu. ft.

(b) Indirect Systems. A system containing more than the quantity of a Group 1 refrigerant allowed in Table 1 shall be of the indirect type with all refrigerant-containing parts, excepting parts mounted outside the building and piping installed in accordance with SBC 7807(1) (c), installed in a machinery room used for no other purpose than for mechanical equipment.

(c) Open Flames in Machinery Rooms. No open flames or apparatus to produce an open flame shall be installed in a machinery room where any refrigerant other than carbon dioxide is used unless the flame is enclosed and vented to the open air. The use of matches, cigarette lighters, halide leak detectors, and similar devices shall not be considered a violation of this paragraph or of SBC 7807(2) (d).

(d) Open Flames in Institutional Occupancies. In Institutional Occupancies, where more than 1 pound of a Group 1 refrigerant, other than carbon dioxide, is used in a system, any portion of which is in a room where there is an apparatus for producing an open flame, then such refrigerant shall be classed in Group 2, unless the flame-producing apparatus is provided with a hood and flue capable of removing the products of combustion to the open air.

(3) Group 2 Refrigerants.

(a) Direct Systems. Direct systems containing Group 2 refrigerants shall not be used for air conditioning for human comfort. For other application, the maximum permissible quantity of Group 2 refrigerants in a direct system is shown in Table 2.

(b) Indirect Systems. The maximum permissible quantity of Group 2

refrigerant in any indirect system is shown in Table 3. Such systems shall be of the following type:

(1) Institutional and Public Assembly Occupancies — Indirect vented closed-surface, or double indirect vented open-spray.

TABLE No. 2

MAXIMUM PERMISSIBLE QUANTITIES OF GROUP 2 REFRIGERANTS FOR DIRECT SYSTEMS

Type of refrigerating system	Maximum pounds for various occupancies			
	Institutional	Public assembly	Residential	Commercial
Sealed Absorption Systems:				
a) In public hallways or lobbies.	0	0	3	3
b) In other than public hallways or lobbies	0*	6	6	20
Self-contained or Unit Systems:				
a) In public hallways or lobbies.	0	0	0	0
b) In other than public hallways or lobbies	0	0*	6	20

*Six pounds allowed when installed in kitchens, laboratories, and mortuariees.

(2) Residential and Commercial Occupancies — Indirect vented closed-surface, or double indirect vented open-spray, or primary circuit of double-refrigerant type.

(c) Machinery Rooms for Indirect Systems, Group 2 Refrigerants.

(1) Indirect systems using Group 2 refrigerants not in excess of the quantities shown in Column 1 of Table 3 shall have all refrigerant-containing parts, excepting parts mounted outside the building and piping installed in accordance with SBC 7807(1) (c), installed in a machinery room used for no other purpose than for mechanical equipment.

TABLE No. 3

MAXIMUM PERMISSIBLE QUANTITIES OF GROUP 2 REFRIGERANTS FOR INDIRECT SYSTEMS

Occupancy	Column 1 Machinery Rooms max. lb.	Column 2 Class T Machinery Rooms max. lb.
Institutional	0	Not more than 500 lb.
Public Assembly	0	Not more than 1000 lb.
Residential	Not more than 300 lb.	No limit
Commercial	Not more than 600 lb.	No limit

(2) Indirect systems using Group 2 refrigerants not in excess of the quantities shown in Column 2 of Table 3 shall have all refrigerant-containing parts installed in a Class T machinery room.

(3) Flame-Producing Devices, Hot Surfaces, and Electrical Equipment in Machinery Rooms. Where a machinery room is required by this Code to house a refrigerating system containing any Group 2 refrigerant other than sulphur dioxide, no flame-producing device or hot surface above 800° F. shall be permitted in such room and all electrical equipment in the room shall conform to the requirements of Hazardous Locations Class I of the latest edition of the National Electrical Code. The use of matches, cigarette lighters, halide leak detectors, and similar devices shall not be considered a violation of this paragraph.

(4) Group 3 Refrigerants

(a) Group 3 refrigerants shall not be used in Institutional, Public Assembly, Residential, or Commercial Occupancies except in laboratories for Commercial Occupancies. In such laboratory installations only unit systems containing no more than 6 pounds shall be used unless the number of persons does not exceed one person per 100 square feet of laboratory floor area, in which case the requirements for Industrial Occupancy shall apply.

SBC 7808 Requirements for Industrial Occupancies.

(1) General. There shall be no restrictions on the quantity or kind of refrigerant used in an Industrial Occupancy, except as specified in SBC 7808 (2) and SBC 7809(10).

(2) Number of Persons. When the number of persons in a refrigerated space, served by a direct system, on any floor above the first floor (ground level or deck level) exceeds one person per 100 square feet of floor area, the requirements of Commercial Occupancy shall apply unless that refrigerated space containing more than one person per 100 square feet of floor area above the first floor is provided with the required number of doors opening directly into approved building exits. Such refrigerated space shall be cut off from the rest of the building by tight construction with tight-fitting doors.

NOTE: The above does not prohibit openings for the passage of products from one refrigerated space to another refrigerated space.

SBC 7809 Installation Requirements.

(1) Foundations and Supports for condensing units or compressor units shall be of substantial and noncombustible construction when more than 6 inches high.

(2) Moving Machinery should be guarded in accordance with accepted safety standards.

(3) Clear Space adequate for inspection and servicing of condensing units or compressor units shall be provided.

(4) Condensing Units or Compressor Units with Enclosures shall be readily accessible for servicing and inspection.

(5) Water Supply and Discharge Connections should be made in accordance with accepted safety and health standards.

(a) Discharge water lines shall not be directly connected to the waste or

sewer system. The waste or discharge from such equipment shall be over and above a trapped and vented plumbing fixture.

(6) Illumination adequate for inspection and servicing of condensing units or compressor units should be provided.

(7) Electrical Equipment and Wiring shall be installed in accordance with accepted safety standards.

(8) Gas Fuel Devices and Equipment used with refrigerating systems shall be installed in accordance with accepted safety standards.

(9) Open Flames. When the quantity of flammable refrigerant in any one refrigerating system exceeds the amount given in Table 4 for each 1000 cubic feet of room volume in which the system or any part thereof is installed, then no flame-producing device or hot surface above 800° F. shall be permitted in such room and all electrical equipment in the room shall conform to the requirements of Hazardous Locations Class I of the latest edition of the National Electrical Code.

TABLE No. 4

MAXIMUM PERMISSIBLE QUANTITIES OF FLAMMABLE REFRIGERANTS

Name	Chemical formula	Maximum quantity in lb. per 1000 cu. ft. of room volume
Butane	C_4H_{10}	2½
Ethane	C_2H_6	2½
Ethyl chloride	C_2H_5Cl	6
Ethylene	C_2H_4	2
Isobutane	$(CH_3)_3CH$	2½
Methyl chloride	CH_3Cl	10
Methyl formate	$HCOOCH_3$	7
Propane	C_3H_8	2½

(10) Flammable Refrigerants as listed in Table 4 shall not be used in a refrigerating system in excess of 1000 pounds unless approved by the authority having jurisdiction.

(11) Machinery Room Requirements (see Definitions, Machinery Room and Machinery Room, Class T).

(a) Each refrigerating machinery room shall be provided with tight-fitting door or doors and have no other openings.

(b) Each refrigerating machinery room shall be provided with means for ventilation to the outer air. The ventilation shall consist of windows or doors opening to the outer air, of the size shown in Table 5, or of mechanical means capable of removing air from the room in accordance with Table 5. The amount of ventilation for refrigerant removal purposes shall be determined by the refrigerant content of the largest system in the machinery room.

(c) Mechanical Ventilation, when used, shall consist of one or more power-driven exhaust fans, which shall be capable of removing from the refrigerating machinery room the amount of air specified in Table 5. The inlet to the fan, or fans, or air duct connection shall be located near the re-

frigerating equipment. The outlet from the fan, or fans, or air duct connections shall terminate outside of the building in an approved manner. Provision should be made for the inlet of air to replace that being exhausted.

(d) Class T Machinery Rooms in basements or subbasements (see Definition, Class T Machinery Room) shall have, as specified in Table 5, mechanical ventilation operating continuously.

(12) Air Duct Systems of air-conditioning equipment for human comfort using mechanical refrigeration should be installed in accordance with accepted safety standards.

TABLE No. 5

MINIMUM AIR EXHAUST QUANTITIES AND OPENINGS

Weight of refrigerant in system, lb.	Mechanical discharge of air, cfm	Open areas of windows and doors sq. ft.
up to 20	150	4
50	250	6
100	400	10
150	550	12½
200	680	14
250	800	15
300	900	17
400	1,100	20
500	1,275	22
600	1,450	24
700	1,630	26
800	1,800	28
900	1,950	30
1,000	2,050	31
1,250	2,250	33
1,500	2,500	37
1,750	2,700	38
2,000	2,900	40
2,500	3,300	43
3,000	3,700	48
4,000	4,600	55
5,000	5,500	62
6,000	6,300	68
7,000	7,200	74
8,000	8,000	80
9,000	8,700	85
10,000	9,500	90
12,000	10,900	100
14,000	12,200	109
16,000	13,300	118
18,000	14,300	125
20,000	15,200	130
25,000	17,000	140
30,000	18,200	145
35,000	19,400	150
40,000	20,500	155
45,000	21,500	160

SBC 7810 Refrigerant Piping, Valves, Fittings and Related Parts

(1) General. Refrigerating piping, valves, fittings, and related parts used in the construction and installation of refrigerating systems shall conform to the American Standard Code for Pressure Piping.

(2) Metal Enclosures or Pipe Ducts for Soft Copper Tubing. Rigid or flexible metal enclosures shall be provided for soft, annealed copper tubing used for refrigerant piping erected on the premises and containing other than Group 1 refrigerants. No enclosures shall be required for connections between condensing unit and the nearest riser box, provided such connections do not exceed 6 feet in length.

(3) Specific Minimum Requirements for Refrigerant Pipe and Tubing.

(a) No less than Schedule 80 wall thickness carbon steel or wrought iron pipe shall be used for Group II and Group III refrigerant liquid lines for sizes 1½ inches and smaller.

No less than Schedule 40 wall thickness carbon steel or wrought iron pipe shall be used for Group I refrigerant liquid lines sizes 6 inches and smaller, Group II and Group III refrigerant liquid lines sizes 2 inches through 6 inches, and Group I, Group II, and Group III refrigerant vapor lines 6 inches and smaller.

Butt-welded carbon steel and butt-welded wrought iron pipe shall not be used for refrigerant liquid lines.

Cast iron pipe shall not be used for Group I, Group II, or Group III refrigerant lines.

(b) Standard iron pipe size copper and red brass (not less than 80 percent copper) pipe may be used and shall conform to ASTM Specification B-42 for copper pipe and ASTM Specification B-43 for red brass pipe.

(c) Watertube size hard copper tubing used for refrigerant piping erected on the premises shall conform to ASTM Specifications B88 Types K or L, for dimensions and specifications, except that copper tubing with outside diameters of ¼ inch and ⅜ inch shall have a minimum nominal wall thickness of not less than 0.030 inch and 0.032 inch, respectively.

(d) Soft annealed copper tubing used for refrigerant piping erected on the premises shall not be used in sizes larger than 1⅜ inch Standard Size (1.375" outside diameter). Mechanical Joints shall not be used on soft annealed copper tubing on sizes larger than ⅞ inch Standard Size (0.875" outside diameter). It shall conform to ASTM Specifications B280. Minimum nominal wall thickness of soft annealed copper tubing shall be as follows:

Standard Size In.	Outside Diameter In.	Wall Thickness In.
¼	0.250	0.030
⅜	0.375	0.032
½	0.500	0.032
⅝	0.625	0.035
¾	0.750	0.042
⅞	0.875	0.045
*1	1.000	0.050
1⅛	1.125	0.050
*1¼	1.250	0.055
1⅜	1.375	0.055

*Not included as standard size in ASTM B280.

(e) Sweat joints on copper tubing used in refrigerating systems containing Group II or Group III refrigerants shall be brazed joints. Soldered joints shall not be used in such refrigerating systems.

(4) Joints and Refrigerant-Containing Parts in Air Ducts. Joints and all refrigerant-containing parts of a refrigerating system located in an air duct of an air-conditioning system carrying conditioned air to and from a humanly occupied space shall be constructed to withstand without leakage, a temperature of 1000° F.

(5) Exposure of Refrigerant Pipe Joints. Refrigerant pipe joints erected on the premises shall be exposed to view for visual inspection prior to being covered or enclosed.

(6) Stop Valves.

(a) General Requirements. All systems containing more than 50 pounds of a Group I refrigerant or 6 pounds of a Group II or III refrigerant, other than systems utilizing nonpositive displacement compressors, shall have stop valves installed as follows:

(1) Each inlet of each compressor, compressor unit, or condensing unit;

(2) Each discharge outlet of each compressor, compressor unit, or condensing unit, and of each liquid receiver.

(b) Systems Containing 100 Pounds or More of Refrigerant. All systems containing 100 pounds or more of a refrigerant, other than systems utilizing nonpositive displacement compressors, shall have stop valves, in addition to those in SBC 7810(6) (a), on each inlet of each liquid receiver except that none shall be required on the inlet of a receiver in a condensing unit nor on the inlet of a receiver which is an integral part of a condenser.

(c) Stop valves used with soft annealed copper tubing or hard drawn copper tubing ⅞ inch standard size (0.875" outside diameter) or smaller shall be securely mounted, independent of tubing fastenings or supports.

(d) Stop valves shall be suitably labelled if it is not obvious what they control. Numbers may be used to label the valves provided a key to the numbers is located near the valves.

(7) Location of Refrigerant Piping.

(a) Refrigerant piping crossing an open space which affords passageway in any building shall be not less than 7½ feet above the floor unless against the ceiling of such space.

(b) Free passageway shall not be obstructed by refrigerant piping. Refrigerant piping shall not be placed in any elevator, dumbwaiter, or other shaft containing a moving object, or in any shaft which has openings to living quarters or to main exit hallways. Refrigerant piping shall not be placed in public hallways, lobbies, or stairways, except that such refrigerant piping may pass across a public hallway if there are no joints in the section in the public hallways, and provided nonferrous tubing of 1 inch nominal diameter (1⅛ inch outside diameter) and smaller be contained in a rigid metal pipe.

SBC 7811 Design and Construction of Equipment

(1) General.

(a) Every part of a refrigerating system, with the exception of pressure gages, control mechanisms and limited charged systems, shall be designed, constructed, and assembled to be capable of withstanding a test pressure not less than the minimum refrigerant leak field test pressure specified in Table 6 without being stressed beyond one-third of its ultimate strength. (See SBC 7811(2).) Limited charged systems equipped with a pressure-relief device, shall be designed, constructed, and assembled to be capable of withstanding a test pressure not less than 1.5 times the setting of the pressure relief device without being stressed beyond ⅓ of its ultimate strength.

NOTE: This paragraph establishes a minimum design working pressure in terms of the field test pressure so that the minimum refrigerant leak field pressure, specified in Table 6, can be safely applied. Rules governing pressure-relief devices, pressure-limiting devices, etc., shall be based on the design working pressure selected.

(b) All materials used in the construction and installation of refrigerating systems shall be suitable for conveying the refrigerant used. No material shall be used that will deteriorate because of the refrigerant, or the oil, or the combination of both.

NOTE: Many refrigerants are corrosive to the usual materials when moisture or air, or both, are present and it is assumed in approving these materials that the system will be charged and operated in accordance with accepted practice, to prevent or minimize this corrosion.

(c) Aluminum, Zinc, or Magnesium shall not be used in contact with methyl chloride in a refrigerating system. Magnesium alloys shall not be used in contact with any halogenated refrigerant.

(2) Minimum Test Pressures. Every refrigerant-containing part of every system, including pressure gages and control mechanisms, shall be tested and proved tight by the manufacturer, at not less than the minimum refrigerant leak field test pressure specified in Table 6 except limited charged systems. (See SBC 7811(3) and SBC 7815(b).)

(a) The test pressure applied to either the high or low side of each refrigerating system shall be at least equal to the design working pressure of the pressure vessels in the high or low side of the system, respectively, or to the setting of the pressure-relief device protecting the respective pressure vessels, whichever is lower, but not less than the minimum refrigerant leak field test pressures specified in Table 6. Any components connected to said pressure vessels shall be of sufficient strength to conform to the design requirements of SBC 7811(1) (a).

(b) Limited Charged Unit Systems shall be tested in accordance with SBC 7811(2) except that limited charged unit systems equipped with a pressure-relief device may be tested and proved tight at a pressure not less than 1½ times the setting of the pressure-relief device.

(3) Equipment Listed by an Approved Nationally Recognized Testing Laboratory having a follow-up inspection service shall be deemed as meeting the intent of the requirements of SBC 7811(1) and (2).

(4) Pressure-Limiting Devices.

(a) Pressure-limiting devices shall be provided on all systems containing

more than 20 pounds of refrigerant and operating above atmospheric pressure, and on all water cooled systems so constructed that the compressor or generator is capable of producing a pressure in excess of the test pressure; except water cooled unit systems containing not more than 3 pounds of a Group I refrigerant providing the operating pressure developed in the system with the water supply shut off does not exceed one-fifth the ultimate strength of the system, or providing an overload device will stop the action of the compressor before the pressure exceeds one-fifth the ultimate strength of the system.

(b) The maximum setting to which a pressure limiting device may readily be set by use of the adjusting means provided shall not exceed 90 percent of the setting of the pressure-relief device installed on the high side of a system, 90 percent of the refrigerant leak field test pressure actually applied, or 90 percent of the design working pressure of the high side of the system, whichever is smallest. The pressure-limiting device shall stop the action of the pressure-imposing element at a pressure no higher than this maximum setting. In determining this maximum setting for systems erected on the premises and field leak tested in accordance with SBC 7811 (1) (a), 90 percent of the leak field test pressures in Table 6 may be utilized in lieu of the field test pressure actually applied. (See SBC 7815(1) and (1) (a) for minimum refrigerant leak field test pressures.

(1) On systems using nonpositive displacement compressors, the pressure-limiting device may be set at the pressure setting of the relief device, the refrigerant leak field test pressure actually applied or the design working pressure of the high side of the system, whichever is smallest, provided the pressure-relief is subject to low side pressure and there are no stop valves on the system as exempted by SBC 7810(6) for nonpositive displacement compressors.

(c) Pressure-limiting devices shall be connected, with no intervening stop valves, between the pressure-imposing element and any stop valve on the discharge side.

(5) Liquid Level Gage Glasses, except those of the bull's-eye or reflex type, shall have automatic closing shut-off valves, and such glasses shall be adequately protected against injury.

(6) Dial of a Pressure Gage, when the gage is permanently installed on the high side of a refrigerating system, shall be graduated up to approximately double the operating pressure, but in no case less than 1.2 times the design working pressure.

(7) Nameplate. Each separately sold condensing unit and each compressor or compressor unit sold for field assembly in a refrigerating system shall carry a nameplate marked with the manufacturer's name, nationally registered trademark or trade name, identification number, the test pressure applied by the manufacturer, and the refrigerant for which it is designed. The refrigerant shall be designated according to ANSI B79.1, Number Designation of Refrigerants.

SBC 7812 Refrigerant-Containing Pressure Vessels

(1) Refrigerant-Containing Pressure Vessels exceeding 6 inches inside diameter, except those having a maximum allowable internal or external working pressure 15 psig or less, shall comply with the rules of Section VIII of the ASME Boiler and Pressure Vessel Code covering the requirements

for the design, fabrication, and inspection during construction of unfired pressure vessels.

(a) Certification for ASME "UM" Stamped Pressure Vessels. Certification requirements on pressure vessels which are built in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code under Paragraph U-1 (g) and stamped with the "UM" symbol (see Paragraph UG-116) can be met by keeping a production series record of material used and tests made. Certification for individual vessels, where required, may be made by abstracting data from the series record on Data Report Form U-3.

(2) Refrigerant-Containing Pressure Vessels not exceeding an inside diameter of 6 inches, irrespective of pressure, shall be listed either individually or as part of refrigeration equipment, by an approved nationally recognized testing laboratory having a follow-up inspection service. Vessels not so listed shall be constructed according to SBC 7812(1) and (1) (a).

(3) Relief Devices. All pressure vessels, irrespective of size or pressure, shall be equipped with relief devices in accordance with the requirements of SBC 7814 of this Code.

(4) Standard Hydrostatic Tests. Fusion welded pressure vessels shall be tested in accordance with Paragraph UG-99, Section VIII of the ASME Boiler and Pressure Vessel Code. (See also SBC 7812(4) (a).)

(a) Pneumatic Tests. Vessels for use in services which cannot tolerate the presence of a testing liquid and which cannot be readily dried, and the parts of which have been previously tested by hydrostatic pressure to not less than 1½ times the design working pressure of the vessel, may be given a pneumatic test as prescribed in Paragraph UG-100, Section VIII of the ASME Boiler and Pressure Vessel Code.

SBC 7813 Relief Devices in General

(1) General. Every refrigerating system shall be protected by a pressure-relief device unless so constructed that pressure due to fire conditions will be safely relieved by some part of the system.

(a) No stop valve shall be located between any automatic pressure-relief device or fusible plug and the part or parts of the system protected thereby, except when the parallel relief devices mentioned in SBC 7814(2) are so arranged that only one can be rendered inoperative at a time for testing or repair purposes.

(b) All pressure-relief devices shall be connected as nearly as practicable directly to the pressure vessel or other parts of the system protected thereby, above the liquid refrigerant level, and installed so that they are readily accessible for inspection and repair and so that they cannot be readily rendered inoperative. Fusible plugs may be located above or below the liquid refrigerant level.

(c) The seats and discs of pressure-relief devices shall be constructed of suitable material to resist refrigerant corrosion or other chemical action caused by the refrigerant. Seats or discs of cast iron shall not be used.

(d) The rated discharge capacity of a pressure-relief valve for a refrigerant-containing vessel, expressed in pounds of air per minute, shall be determined at a pressure at the inlet of the relief valve equal to 110 percent of the valve setting in accordance with Paragraph UG-131, Section VIII of the ASME Boiler and Pressure Vessel Code.

(e) The rated discharge capacity of a rupture member of fusible plug discharging to atmosphere under critical flow conditions in pounds of air per minute shall be determined by the following formulas:

$$C=0.8\ P_1 d^2$$

$$d=1.12\ \sqrt[2]{\frac{C}{P_1}} \qquad (1)$$

Where

C=minimum required discharge capacity, in lb. of air per min.

d=minimum diameter of bore of fusible plug or internal diameter of inlet pipe to rupture member in inches

Where for rupture members:

P_1=(set pressure x 1.10) + 14.7

For fusible plugs:

P_1=absolute saturation pressure, corresponding to the stamped temperature melting point of the fusible plug or the critical pressure of the refrigerant used, whichever is smaller, psia

(f) All pressure-relief devices (not fusible plugs) shall be directly pressure-actuated.

(g) The size of the discharge pipe from the pressure-relief device shall be not less than the size of the relief device outlet. The discharge from more than one relief device may be run into a common header, the area of which shall be not less than the sum of the areas of the pipes connected thereto.

(h) The length of discharge piping permitted to be installed on the outlet of a relief valve, rupture member, or fusible plug shall be determined as follows:

$$d=\sqrt[3]{\frac{C+\frac{3\ P\ d^{5/2}}{L^{1/2}}}{\frac{C^2 L}{9P^2}}} \qquad (2)$$

Where

C=minimum required discharge capacity, in lb. of air per min.

d=internal diameter of pipe in in.

L=length of discharge pipe in ft.

$P=0.25P_1$ (P_1 is defined under Equation 1.)

(See Table 7 for computations derived from the preceding formula.)

(2) Pressure-Relief Devices for Positive Displacement Compressors. Positive displacement compressors operating above 15 pounds per square inch gage and having a displacement exceeding 50 cubic feet per minute, shall be equipped by the manufacturer with a pressure-relief device of adequate size and pressure setting to prevent rupture of the compressor located between the compressor and stop valve on the discharge side. The discharge from such relief device may be vented to the atmosphere or into the pressure side of the system.

(3) Discharge of Pressure-Relief Devices and Fusible Plugs on all systems containing more than 6 pounds of Group II or Group III refrigerants shall be to the outside of the building in an approved manner. Discharge of pressure-relief devices and fusible plugs on all systems containing more than 100 pounds of Group I refrigerants, unless installed in a Machinery Room

used for no purpose other than to house mechanical equipment and complying with the provisions as specified in SBC 7809(11) shall be to the outside of the building in an approved manner.

(a) Pressure-relief devices may discharge into the low side of the system, provided the pressure-relief devices are of a type not appreciably affected by back pressures and provided the low side of the system is equipped with pressure-relief devices. The relief devices on the low side of the system shall have sufficient capacity to protect the pressure vessels that are relieved into the low side of the system, or to protect all pressure vessels on the low side of the system, whichever relieving capacity is the largest, as computed by the formula in SBC 7814(5). Such low side pressure-relief devices shall be set in accordance with SBC 7814(6) and vented to the outside of the building in an approved manner.

(4) Ammonia Discharge. Where ammonia is used, the discharge may be into a tank of water which shall be used for no purpose except ammonia absorption. At least 1 gallon of fresh water shall be provided for each pound of ammonia in the system. The water used shall be prevented from freezing without the use of salt or chemicals. The tank shall be substantially constructed of not less than ⅛ inch or No. 11 U.S. gage iron or steel. No horizontal dimension of the tank shall be greater than one-half the height. The tank shall have hinged cover, or, if of the enclosed type, shall have a vent hole at the top. All pipe connections shall be through the top of the tank only. The discharge pipe from the pressure-relief valves shall discharge the ammonia in the center of the tank near the bottom.

(5) Sulphur Dioxide Discharge. Where sulphur dioxide is used, the discharge may be into a tank of absorptive brine which shall be used for no purpose except sulphur dioxide absorption. There shall be 1 gallon of standard dichromate brine (2½ pounds sodium dichromate per gallon water) for each pound of sulphur dioxide in the system. Brines made with caustic soda or soda ash may be used in place of sodium dichromate, provided the quantity and strength give the equivalent sulphur dioxide power. The tank shall be substantially constructed of not less than ⅛ inch or No. 11 U.S. gage iron or steel. The tank shall have a hinged cover, or, if of the enclosed type, shall have a vent hole at the top. All pipe connections shall be through the top of the tank only. The discharge pipe from the pressure-relief valve shall discharge the sulphur dioxide in the center of the tank near the bottom.

SBC 7814 Relief Devices for Pressure Vessels

(1) General. The rules of this section are based upon the rules given in Paragraphs UG-125 to UG-134 inclusive, of Section VIII of the ASME Boiler and Pressure Vessel Code, with such additional modifications as are necessary for control of refrigerants.

(2) Pressure Vessels over 3 Cubic Feet. Each pressure vessel containing liquid refrigerant with internal gross volume exceeding 3 cubic feet, except as specified in SBC 7814(4), and which may be shut off by valves from all other parts of a refrigerating system, shall be protected by a pressure-relief device, having sufficient capacity to prevent the pressure in the pressure vessel from rising more than 10 percent above the setting of the pressure-relief device. (See SBC 7814(5).)

(a) Pressure Vessels over 3 Cubic Feet, but Less than 10 Cubic Feet. Under conditions specified in SBC 7814(2), a single relief device (Relief

valve or rupture member) may be used on pressure vessels having less than 10 cubic feet internal gross volume.

(b) Pressure Vessels of 10 Cubic Feet Internal Gross Volume or Over. Under conditions specified in SBC 7814(2), a relief device system consisting of a pressure-relief device in parallel with a second pressure-relief device as described in SBC 7813(1) (a) shall be provided on pressure vessels having internal gross volume of 10 cubic feet or over. Each relief valve or rupture member shall have sufficient capacity to prevent the pressure in the pressure vessel from rising more than ten percent above the setting of the pressure-relief device. (See SBC 7814(8).)

(1) Relief Valves Discharging into Low Side of the System. Under conditions permitted in SBC 7913(3) (a), a single relief valve (not rupture member) of the required relieving capacity may be used on vessels of 10 cubic feet or over.

(c) Relief Devices in Parallel on Large Vessels. In cases where large pressure vessels containing liquid refrigerant except as specified in SBC 7814(4) require the use of two or more pressure-relief devices in parallel to obtain the capacity required by SBC 7814(5), the battery of pressure-relief devices shall be considered as a unit, and therefore as one pressure-relief device.

(3) Pressure Vessels with Internal Gross Volume of 3 Cubic Feet or Less. Each pressure vessel having an internal gross volume of 3 cubic feet or less, containing liquid refrigerant, except as specified in SBC 7814(4), and which may be shut off by valves from all other parts of a refrigerating system, shall be protected by a pressure-relief device, or fusible plug. A fusible plug is permitted only on the high side of a refrigerating system. Pressure vessels of less than 3 inch I D are exempt from these requirements.

(a) Relief Valves on Pressure Vessels with Gross Volume of 3 Cubic Feet or Less. If a relief valve or rupture member is used to protect a pressure vessel, the ultimate bursting pressure of the pressure vessl so protected shall be at least 2½ times the pressure setting of the pressure-relief valve or rupture member.

(b) Fusible Plugs and Pressure Vessels with Gross Volume of 3 Cubic Feet or Less. If a fusible plug is used, the ultimate bursting pressure of the pressure vessel so protected shall be at least 2½ times the refrigerant saturation pressure, psia, corresponding to the stamped temperature on the fusible plug, or at least 2½ times the critical pressure of the refrigerant used, whichever is smaller.

(4) Relief-Device for Pressure Vessels Used As, or As Part of Evaporator. Pressure vessels having internal diameters greater than 6 inches used as, or as part of, evaporators insulated or installed in insulated space, and which may be shut off by valves from all other parts of a refrigerating system shall be protected by a pressure-relief device in accordance with the provisions of SBC 7814(2) and (3) except that the provisions of SBC 7814(2) (b), requiring a second parallel relief device, shall not apply. Pressure vessels used as evaporators, having internal diameters of 6 inches or less, are exempt from pressure-relief valve requirements.

(5) Required Capacity. The minimum required rated discharge capacity of the pressure-relief device or fusible plug for a refrigerant-containing vessel shall be determined by the following:

$$C=fDL \qquad (3)$$

Where

C=minimum required discharge capacity of the relief device in lb. of air per min.

D=outside diameter of the vessel in ft.

L=length of the vessel in ft.

f=factor dependent upon kind of refrigerant, as follows:

Kind of refrigerant	Value of f
Ammonia (Refrigerant 717)	0.5
Refrigerants 12, 22 and 500	1.6
Refrigerants 502, 13, 13B1, and 14 when on cascaded systems	2.5
All other refrigerants	1.0

(6) Pressure-Relief Device Setting. Except as permitted in SBC 7814(3) (a), all pressure-relief devices shall be set to start to function at a pressure not to exceed the design working pressure of the pressure vessel as determined by the manufacturer and stamped on the pressure vessel or system.

(7) Rupture Member Setting. All rupture members used in lieu of, or in series with, a relief valve shall function at a pressure not to exceed the design working pressure of the vessel and the conditions of application shall conform to the requirements of Section VIII of the ASME Boiler and Pressure Vessel Code.

Rupture members installed ahead of relief valves need not be larger, but shall not be smaller, than the relief valve inlet. (See SBC 7813(1) (c).)

(8) Marking of Relief Devices.

(a) All pressure-relief valves for refrigerant-containing vessels shall be set and sealed by the manufacturer. Each relief valve shall be marked by the manufacturer with the data required in Paragraph UG-129(a) of Section VIII of the ASME Boiler and Pressure Vessel Code.

(b) Each rupture member for refrigerant-containing pressure vessels shall be marked with the information required in Paragraph UG-129(d) of Section VIII of the ASME Boiler and Pressure Vessel Code.

SBC 7815 Field Tests

(1) General. Every refrigerant-containing part of every system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gages, and control mechanisms, that are factory tested, shall be tested and proved tight after complete installation, and before operation, at not less than the minimum refrigerant leak field test pressures shown in Table 6, or in accordance with Section SBC 7815(1) (a) and (b).

(a) Systems erected on the premises using Group I refrigerant and with copper tubing not exceeding ⅝ inch O D, with wall thickness as required by SBC 7815(3) (c) and (d) may be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 70° F. or higher.

(b) Limited charged systems equipped with a pressure-relief device, erected on the premises, shall be tested at a pressure not less than 1½ times the pressure setting of the relief device.

(2) Test Medium. No oxygen or any combustible gas or combustible mixture of gases shall be used within the system for testing.

TABLE No. 6
MINIMUM REFRIGERANT LEAK FIELD TEST PRESSURES

Refrigerant name & number*	Chemical formula	Minimum field refrigerant leak test pressures, psig High side	Low side
Ammonia (717)	NH_3	300	150
Butane (600)	C_4H_{10}	95	50
Carbon dioxide (744)	CO_2	1500	1000
Dichlorodifluoromethane (12)	$CCl2F_2$	235	140
Dichlorodifluoromethane 73.8% (500)	CCl_2F_2	285	150
Ethylidene fluoride 26.2% / Dichloroethylene (1130)	CH_3CHF_2 / $C_2H_2Cl_2$	30	30
Dichloromethane (Methylene chloride) (30)	CH_2Cl_2	30	30
Dichloromonofluoromethane (21)	$CHCl_2F$	70	40
Dichlorotetrafluoroethane (114)	$C_2Cl_2F_4$	50	50
Ethane (170)	C_2H_6	1200	700
Ethyl chloride (160)	C_2H_5Cl	60	50
Ethylene (1150)	C_2H_4	1600	1200
Isobutane (601)	$(CH_3)_3CH$	130	70
Methyl chloride (40)	CH_3Cl	210	120
Methyl formate (611)	$HCOOCH_3$	50	50
Monobromotrifluoromethane (13B1)	$CBrF_3$	435	245
Monochlorodifluoromethane (22)	$CHClF_2$	300	150
Monochlorodifluoromethane 48.8%, and Monochloropentafluoroethane 51.2% (502)	$CHClF_2$ / $CClF_2CF_3$	300	150
Monochlorotrifluoromethane (13)	$CClF_3$	685**	685**
Octafluorocyclobutane (C318)	C_4F_8	130	70
Propane (290)	C_3H_8	300	150
Sulphur dioxide (764)	SO_2	170	85
Trichloromonofluoromethane (11)	CCl_3F	20	20
Trichlorotrifluoroethane (113)	$C_2Cl_3F_3$	20	20

NOTES:

(a) For refrigerants not listed in Table 6 the test pressure for the high pressure side shall not be less than the saturated vapor pressure of the refrigerant at 150° F. The test pressure for the low pressure side shall be not less than the saturated vapor pressure of the refrigerant at 110° F. However, the test pressure for either the high or low side need not exceed 125 percent of the critical pressure of the refrigerant. In no case shall the test pressure be less than 30 PSIG.

(b) When a compressor is used as a booster to obtain a low pressure and discharges into the suction line of another system, the booster compressor is considered a part of the low side, and values listed under the low side column in Table 6 shall be used for both high and low side of the booster compressor provided that a low pressure stage compressor of the positive displacement type shall have a pressure-relief valve.

(c) In field testing systems using nonpositive displacement compressors, the entire system shall be considered for field test purposes as the low side pressure.

* ASHRAE Designation.

** Critical pressure is 561 psia at critical temp. of 83.9° F. (See Note (a) above.)

(a) The means used to build up the test pressure shall have either a pressure-limiting device or a pressure reducing device and a gage on the outlet side.

(3) Posting of Tests. A dated declaration of test should be provided for all systems containing 50 lb. or more of refrigerant, where required by SBC 7815(1). The declaration should be mounted in a frame, protected by glass, and posted in the machinery room and should give the name of the refrigerant and the field refrigerant leak test pressures applied to the high side and the low side of the system. The declaration of test should be signed by the installer and, if an inspector is present at the tests, he should also sign the declaration. When requested, copies of this declaration shall be furnished to the enforcing authority.

The leak test pressure requirements of Table 6 are not intended to apply to gas bulk storage tanks that are not permanently connected to a refrigeration system.

SBC 7816 Instructions

(1) Signs. Each refrigerating system erected on the premises shall be provided with an easily legible permanent sign securely attached and easily accessible, indicating thereon the name and address of the installer, the kind and total number of pounds of refrigerant required in the system for normal operations, and the refrigerant leak field test pressure applied.

(2) Metal Signs for Systems Containing More than 100 Pounds of Refrigerant. Systems containing more than 100 pounds of refrigerant shall be provided with metal signs having letters not less than ½ inch in height designating the main shutoff valves to each vessel, main steam or electrical control, remote control switch, and pressure-limiting device. On all exposed high pressure and low pressure piping in each room where installed outside the machinery room, shall be signs, as specified above, with the name of the refrigerant and the letters "HP" or "LP".

(3) New Sign for Changed Refrigerant. When the kind of refrigerant is changed as provided in SBC 7816(7) (Substitution of Refrigerant), there shall be a new sign, of the same type as specified in SBC 7816(2), indicating clearly that a substitution has been made, and stating the same information for the new refrigerant as was stated in the original.

(4) Charging and Discharging Refrigerants. When refrigerant is added to a system, except a unit system requiring less than 6 pounds of refrigerant it shall be charged into the low pressure side of the system. Any point on the downstream side of the main liquid line stop valve shall be considered as part of the low pressure side when operating with said stop valve in the closed position. No service container shall be left connected to a system except while charging or withdrawing refrigerant.

(5) Refrigerants Withdrawn from Refrigerating Systems shall be transferred to approved containers only. No refrigerant shall be discharged to a sewer.

(6) Containers Used for Refrigerants Withdrawn from a Refrigerating System shall be carefully weighed each time they are used for this purpose, and the containers shall not be filled in excess of the permissible filling weight for such containers and such refrigerants as are prescribed in the pertinent regulations of the Interstate Commerce Commission.

(7) Substitution of Kind of Refrigerant in a system shall not be made without the permission of the approving authority, the user, and the makers of the original equipment, and due observance of safety requirements, including:

(a) The effects of the substituted refrigerant on materials in the system;

(b) The possibility of overloading the liquid receiver which should not be more than 80 percent full of liquid;

(c) The liability of exceeding motor horsepower, design working pressure, or any other element that would violate any of the provisions of this Code;

(d) The proper size of refrigerant controls;

(e) The effect on the operation and setting of safety devices;

(f) The possible hazards created by mixture of the original and the substituted refrigerant;

(g) Effect of the classification of the refrigerant as provided in this standard.

(8) Refrigerant Stored in a Machinery Room shall be not more than 20 percent of the normal refrigerant charged nor more than 300 pounds of the refrigerant, in addition to the charge in the system and the refrigerant stored in a permanently attached receiver, and then only in approved storage containers.

(9) Masks or Helmets. One mask or helmet shall be provided at a location convenient to the machinery room when an amount of a Group II refrigerant between 100 and 1000 pounds, inclusive, is employed. If more than 1000 pounds of a Group II refrigerant are employed, at least two masks or helmets shall be provided.

(a) Only complete helmets or masks marked as approved by the Bureau of Mines of the United States Department of the Interior and suitable for the refrigerant employed shall be used and they shall be kept in a suitable cabinet immediately outside the machinery room or other approved accessible location.

(b) Canisters or cartridges of helmets or masks shall be renewed immediately after having been used or the seal broken and, if unused, the canisters shall be renewed not later than the date noted on the canister labels.

(10) Maintenance. All refrigerating systems shall be maintained by the user in a clean condition, free from accumulations of oily dirt, waste, and other debris, and shall be kept readily accessible at all times.

(11) Responsibility as to Operation of the System. It shall be the duty of the person in charge of the premises on which a refrigerating system containing more than 50 pounds of refrigerant is installed, to place a card conspicuously as near as practicable to the refrigerant compressor giving directions for the operation of the system, including precautions to be observed in case of a breakdown or leak as follows:

(a) Instruction for shutting down the system in case of emergency;

(b) The name, address, and day and night telephone numbers for obtaining service;

(c) The name, address, and telephone number of the municipal inspection department having jurisdiction, and instructions to notify said department immediately in case of emergency.

(12) Pressure Gages should be checked for accuracy prior to test and immediately after every occasion of unusually high pressure, equal to full scale reading either by comparison with master gages or by setting the pointer as determined by a dead weight pressure gage tester.

TABLE NO. 7—LENGTH OF DISCHARGE PIPING FOR RELIEF VALVES OR RUPTURE MEMBERS OF VARIOUS DISCHARGE CAPACITIES

Equiv. length of discharge pipe, ft. (L)	Discharge capacity in lg. of air per min. (C) Standard wall iron pipe sizes, in.							
	½	¾	1	1¼	1½	2	2½	3
RELIEF DEVICE SET AT 25 PSIA (P_1)								
50	0.81	1.6	2.9	5.9	8.7	16.3	25.3	43.8
75	0.67	1.4	2.4	4.9	7.2	13.3	20.9	35.8
100	0.58	1.2	2.1	4.2	6.2	11.5	18.0	30.9
150	0.47	0.95	1.7	3.4	5.0	9.4	14.6	25.3
200	0.41	0.8	1.5	2.9	4.4	8.1	12.6	21.8
300	0.33	0.67	1.2	2.4	3.6	6.6	10.5	17.9
RELIEF DEVICE SET AT 50 PSIA (P_1)								
50	1.6	3.3	5.9	11.9	17.4	32.5	50.6	87.6
75	1.3	2.7	4.9	9.7	14.3	26.5	41.8	71.5
100	1.2	2.3	4.2	8.4	12.3	23.0	36.0	61.7
150	0.94	1.9	3.5	6.9	10.0	18.7	29.2	50.6
200	0.81	1.6	2.9	5.9	8.7	16.3	25.3	43.7
300	0.66	1.3	2.5	4.9	7.1	13.3	21.0	35.7
RELIEF DEVICE SET AT 75 PSIA (P_1)								
50	2.4	4.9	8.9	17.9	26.1	48.7	75.9	131.5
75	2.0	4.1	7.3	14.6	21.4	39.8	62.6	107.0
100	1.7	3.5	6.4	12.6	18.5	34.4	54.0	92.6
150	1.4	2.8	5.2	10.3	15.0	28.0	43.8	75.9
200	1.2	2.5	4.4	8.9	13.1	24.4	37.9	65.6
300	0.9	2.0	3.7	7.3	10.7	19.9	31.5	53.5
RELIEF DEVICE SET AT 100 PSIA (P_1)								
50	3.2	6.6	11.9	23.8	34.8	65.0	101.2	175.2
75	2.7	5.4	9.7	19.4	28.6	53.0	83.6	143.0
100	2.3	4.6	8.5	16.8	24.6	45.9	72.0	123.6
150	1.9	3.8	6.9	13.7	20.0	37.4	58.4	101.2
200	1.6	3.3	5.9	11.9	17.5	32.5	50.6	87.6
300	1.3	2.7	4.9	9.7	14.2	26.5	42.0	71.4

TABLE NO. 7—(Continued)
LENGTH OF DISCHARGE PIPING FOR RELIEF VALVES OR RUPTURE MEMBERS OF VARIOUS DISCHARGE CAPACITIES

Equiv. length of discharge pipe, ft. (L)	Discharge capacity in lg. of air per min. (C) Standard wall iron pipe sizes, in.							
	½	¾	1	1¼	1½	2	2½	3
RELIEF DEVICE SET AT 150 PSIA (P_1)								
50	4.9	9.9	17.9	35.7	52.3	97.5	151.8	262.8
75	4.0	8.1	14.6	29.2	42.9	79.5	125.4	214.5
100	3.5	6.9	12.7	25.2	36.9	68.9	108.0	185.4
150	2.8	5.7	10.4	20.6	30.0	56.1	87.6	151.8
200	2.4	4.9	8.9	17.8	26.2	48.7	75.9	131.4
300	1.9	4.0	7.4	14.6	21.1	39.7	63.0	107.1
RELIEF DEVICE SET AT 200 PISA (P_1)								
50	6.5	13.2	23.8	47.6	69.7	130.0	202.4	350.4
75	5.3	10.8	19.4	38.9	57.2	106.0	167.2	286.0
100	4.6	9.2	16.9	33.6	49.2	91.8	144.0	247.2
150	3.8	7.6	13.8	27.4	40.0	74.8	116.8	202.4
200	3.2	6.5	11.8	23.8	34.9	64.9	101.2	175.2
300	2.6	5.3	9.8	19.4	28.4	52.9	84.0	142.8
RELIEF DEVICE SET AT 250 PSIA (P_1)								
50	8.1	16.5	29.8	59.5	87.1	162.5	253.0	437.0
75	6.7	13.5	24.3	48.6	71.5	132.5	209.0	357.5
100	5.8	11.6	21.2	42.0	61.6	114.8	180.0	309.0
150	4.7	9.5	17.3	34.3	50.0	93.5	146.0	253.0
200	4.1	8.2	14.8	29.7	43.7	81.2	126.5	219.0
300	3.3	6.7	12.3	24.3	35.5	66.2	105.0	178.5
RELIEF DEVICE SET AT 300 PSIA (P_1)								
50	9.7	19.8	35.7	71.4	104.5	195.0	303.6	525.6
75	7.9	16.2	29.1	58.3	85.8	159.0	250.8	429.0
100	6.9	13.9	25.4	50.4	73.9	137.7	216.0	370.8
150	5.6	11.3	20.7	41.1	60.0	112.2	175.2	303.6
200	4.9	9.8	17.8	35.6	52.4	97.4	151.8	262.8
300	3.9	7.9	14.7	29.1	42.6	79.4	216.0	214.2

Table No. 7 Cont.

586 7814

SBC 7901 GAS BURNERS. Definitions of Gas Burners. The following terms shall mean:

GAS BURNER. A device for the final conveyance of the gas, or a mixture of gas and air, to the combustion of a boiler, furnace, device, or appliance, used in connection with a heating system and shall include gas designed appliances, conversion burners, direct gas fired air heaters and dual fuel burners.

GAS BURNER EQUIPMENT. Shall include gas burners, as above defined, vent connectors, vent flues, chimney liners, and all piping (other than supply piping from meter to appliance shutoff valve), fans, blowers, control devices and accessories connected to the burners.

CONVERSION BURNER. A gas burner accessory or device designed to supply gaseous fuel to and properly burn same within the combustion chamber of a boiler, furnace, or other device originally designed to utilize another fuel.

GAS DESIGNED APPLIANCE. Any space heating appliance designed for the exclusive use of gaseous fuel, excepting such auxiliary heaters as may be installed in an approved masonry fireplace.

DIRECT GAS FIRED AIR HEATERS. A gas heating device in which gas is burned and in which the products of combustion are mixed with the air which is to be heated in passing through the heater. The term shall be taken to mean the unit and equipment from its outside air inlet to the exit where the heated air leaves the unit.

DUAL FUEL BURNING. A gas burner firing into the same combustion zone into which another fuel is utilized.

SBC 7902 Approval of Equipment. Approval of Gas Burner Required.

(1) Any gas burner bearing the listing or the approved label of the American Gas Association or other nationally recognized testing laboratory may be installed without further approval, providing such gas burning appliance also meets the appropriate requirements of the applicable sections of this Code, and such other requirements as established by the administrative authority.

(2) Gas burning appliances not carrying the listing or approval of the American Gas Association or other nationally recognized testing laboratory shall not be installed without prior approval of the administrative authority.

Used Gas Burners Procedures. No person shall install any used gas burner until he has furnished the administrative authority with a statement that said gas burner has been checked and found to be equivalent to new equipment in operation and safety, and also a letter from the purchaser acknowledging that said purchaser is buying a used gas burner.

Approval Requirements — General.

(1) Pilots. The gas supply line to the pilot or pilots shall be connected ahead of the main burner pressure regulator and appliance shut-off valve and shall be provided with a separate cock. However, where complete shut-off type automatic pilot is provided with approved flow interrupter the pilot

line shall be connected to this control and such control shall be located ahead of the main burner pressure regulator and after the appliance shut-off valve.

(a) The main burner shall light from the flame that activates the safety mechanism when this is turned down to the point where it will just actuate the safety pilot operating mechanism.

(b) Appliances having more than one combustion chamber shall be provided with individual safety pilots or with a safety supervised runner pilot.

(c) The flames from each burner shall freely ignite the gas from adjacent burners when operating at the prevailing gas pressure or when the gas pressure is reduced to deliver about ⅓ the full gas rate.

(d) Electronic safety equipment shall be provided for all burners exceeding 400,000 BTU per hour input, except on multiple burner equipment where each section of 400,000 BTU per hour input or fraction thereof is supervised by an approved safety pilot.

(e) Copper or iron tubing shall not be used for supply piping within the burner heat zone to pilot burners.

(f) The construction of all safety pilots shall be such that in the event of breakage or burning out of the flame detection element they shall fail in the safe position.

(g) Pilots shall be so located that when they are extinguished they shall relight from the main burner.

(2) Burners. Luminosity in burner flames will not be permitted. Burners shall be so designed and constructed that flames show no tendency to lift or blow off the burner ports.

Approval Requirements — For Conversion Burners and Dual Fuel Burners with Inputs 1,000,000 BTU and Over.

(1) Pilots. Automatically lighted pilots or constant burning pilots may be used. Burners having a constant burning pilot shall be safety supervised to provide 100% (pilot and main burner) shut-off on flame failure.

(a) A flame safeguard so constructed and installed that no fuel can flow to the main burner or burners or burner group unless satisfactory ignition is assured, shall be employed at each burner or group of burners operating as a unit. Fuel to the main burners shall be automatically shut off in case of flame failure at point of supervision.

(b) The response time of the flame safeguard to de-energize the main fuel shut-off device on flame failure shall not exceed 5 seconds. Pilot supervision by such flame safeguard shall be only at the point where the flame will effectively ignite the burner or burners. The circuit and devices shall be arranged so that the fuel will be shut off in case of electrical failure.

(c) Electric ignition systems on gas operation shall ignite only a pilot. The input to the pilot shall not exceed 2% of the maximum input to the main burner as fired. If ignition of the pilot is not obtained in 30 seconds, the fuel shall be turned off automatically. Continuous ignition spark is prohibited.

(d) Pilots shall effect immediate ignition of the fuel and the main burner even when the gas supply to the pilots is reduced to a point where the flame is just sufficient to actuate or energize the flame-detection device.

(c) All pilot burners and flame safeguard units shall be so located as to assure proper ignition of all burners or ports, readily accessible for service and maintenance, and so fixed that they must be readily returned to the original position after removal for servicing. Pilot burners shall be so placed that they can be safely lighted manually if required.

(2) Automatic or Manually Lit.

(a) An automatically lighted installation shall automatically recycle to meet control requirements. Such installation shall have necessary controls and devices to automatically ignite the safety pilot and open the re-cycling safety shut-off valve to permit ignition of the main burner from the safety pilot when fuel input is required and to automatically shut off all gas to pilot and main burners when fuel input is not required.

(b) Burners which are manually lit are those which require a manual starting sequence by closing a push button start switch to open the pilot solenoid valve; the pilot being ignited by manual torch or from an electric spark ignition system which is energized with the same push button start switch. The main burner is then ignited from the safety pilot by opening the manual firing valve after having opened the manual reset safety shut-off valve.

(3) Control Valves.

(a) On burners with maximum input ratings exceeding 1,000,000 BTU per hour a fuel input control valve and a safety shut-off valve shall be used. These shall be separate and independent valves.

(b) The positioning of the gas valves shall be such that the safety shut-off valve is on the inlet side of the fuel input control valve except by special approval of the administrative authority.

(c) Main burner safety shut-off valves shall be of an approved type. These valves shall be capable of opening only when energized and shall be so constructed that they may not be readily blocked in the open position.

(d) Electrically operated safety shut-off valve shall not depend upon the closing of an electrical circuit to shut off the fuel supply.

(e) Means shall be provided for any easy sensitive test for gas tightness of the safety shut-off and fuel input control valve when in the closed position.

(f) The safety shut-off valve shall be an approved quick closing type.

(4) Safety Shut Off Valve Switch.

The burner shall have either of the following as part of the starting sequence.

(a) Automatic installations shall have a switch in the safety shut-off valve which will prove that the valve is 100% closed. This switch will be interlocked into the system to prevent any starting procedure unless proven closed. This switch will close when the valve has had an over travel of the valve seat.

(b) Manual installations shall be equipped with an electrical limit switch which will close the firing valve before the safety pilot can be ignited. The starting switch shall consist of a momentary contact pushbutton "start-stop" switch so arranged as to prevent recycling of pilot following action of any safety device to shut off the fuel.

(5) Purge Cycles.

(a) On automatic recycling jobs where intermittant or interrupted pilots are used and all combustion air is provided for by forced and/or induced draft fans, a purge time of approximately one minute shall be provided in the starting sequence and accomplished before the pilot valve is opened.

A re-purge must also be accomplished before re-ignition can be attempted after a flame failure has been detected.

Air flow must be established and proven before the purge timer is energized to begin its timing cycle.

(b) On manually lighted installations the combustion chamber and flue gas passages shall be purged before igniting pilots in accordance with instructions posted by the installer.

(c) Air openings into the burner shall be provided of sufficient area to provide an adequate amount of air for complete combustion under minimum draft conditions and at the maximum rate of firing. The air shall be introduced in a manner so as to assure thorough mixing of the fuel and air in order to complete the combustion within the space provided.

(d) For forced or induced draft operation, limiting devices shall be provided to shut off the fuel in the event of air failure.

(e) The purge cycle shall not begin until the interlock as required in 4 is proven closed.

(6) Main Burners. All metallic parts of the burners exposed to the heat of the furnace shall be constructed of an alloy suitable for continuous operation at existing temperatures, or protected from furnace radiation when not in use.

(a) Gas burners shall be of the inshot type. The turndown ratio shall be such as to assure positive and safe ignition and complete stability during operation of main flames on all burners or ports throughout the required range of operation.

(7) Combustion Control. Installations primarily used for space heating shall be equipped with adequate and proper devices to control the use of gas input demand according to building requirements. Control systems shall be designed and installed to assure safe, stable and accepted proper standards of combustion and efficiency throughout the entire range of operation. Paragraphs 1 to 4 hereof set forth minimum standards within input demand classifications of types of control systems but they shall not preclude the use of more extensive equipment to obtain required or better results for specific jobs.

(a) For fuel inputs not exceeding 3,000,000 BTU per hour the combustion control system may be the "on-off" type which shall consist of a pressure or heat actuated controller to operate an approved slow opening "on-off" gas input control valve properly interlocked with air louvers or dampers where such are used.

(b) For fuel inputs not exceeding 5,000,000 BTU per hour the combustion control system may be "high-low-off" or "on-off" (with timed low fire start) type which shall consist of a pressure or heat actuated controller to operate an approved "high-low-off" or "on-off" (with timed low fire start) fuel input control valve or a group of valves to accomplish the sequence of operation properly interlocked with air louvers and dampers where such are

used. This valve or valves shall be separate and in addition to the safety valve. Ignition of main flame shall be accomplished on low fire setting with the low fire setting maintained for such time as draft conditions are established to meet high fire requirements.

(c) For fuel inputs exceeding 5,000,000 BTU per hour the combustion control system shall be the "modulating" type which shall consist of properly interlocked draft control dampers and fuel input control valves to operate in conjunction with each other to maintain proper ratio of fuel and air in accordance with load requirements. The fuel input control valve shall be separate and in addition to the safety valve. Ignition of main flame shall be accomplished on low fire setting maintained for such time as draft conditions are established to meet high fire requirements.

Modulating controls that are inter-connected by mechanical linkage to inlet air louvers of natural draft burners, shall have this linkage so arranged that the louvers will go to the open position in the event of failure of the linkage, provided such failure could change the fuel-air ratio.

(d) The manufacturer or authorized distributor shall file with the administrative authority drawings showing electric wirings, gas piping of the gas burner and controls, method of mounting burner and installation and operating instructions.

(8) Dual Fuel Burning. In addition to the requirements of SBC 7902, 1-8, gas burners to be installed in conjunction with other combustion equipment shall conform to the following requirements.

(a) Controls may be common to both fuels or may be independent. Transfer from one fuel to the other shall be by a manual interlock switching system to prevent the gas and other fuel being used simultaneously except by special permission of the Administrative Authority. The transfer switch shall have a center off position and will not pass through the center off position without stopping in the off position.

(b) Proper protection of the gas and other combustion equipment shall be provided from the effects of each other.

SBC 7903. INSTALLATION REQUIREMENTS. General. Requirements for all Gas Burners.

(1) Piping. All gas piping installed for gas burners shall be in accordance with the requirements of Chapter 85 of this code.

(2) Combustion Air. Combustion air for all gas burners shall be in accordance with the requirements of Chapter 75 of this code.

(3) Venting. The venting of all gas burners shall be in accordance with section SBC 7103 of this chapter and Chapter 75 of this code.

(4) Accessibility for Service.

(a) Every gas appliance shall be located with respect to building construction and other equipment so as to permit access to the appliance. Sufficient clearance shall be maintained to permit cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls, and vent connections; the lubrication of moving parts where required; and the adjustment and cleaning of burners and pilots.

(b) For attic installation the passage way and servicing area adjacent to the appliance shall be floored.

(c) Appliances listed for outdoor installations may be installed without protection in accordance with the provision of their listing and shall be accessible for servicing.

(5) Limiting Devices. All boilers and furnaces shall be provided with automatic safety devices arranged to prevent excessive steam pressures, water temperatures, or air temperatures by shutting off the fuel supply.

(a) Steam boilers shall be provided with means to guard against firing a dry boiler or one in which the water is dangerously low.

(b) Limiting devices shall not depend upon the closing of an electrical circuit to shut off the fuel supply.

(c) All limiting devices shall shut off fuel to all main burners.

(d) Shutoff valves shall not be installed in the piping between the boiler and pressure or water temperature limiting devices.

(6) Electric Wiring. Electric wiring and equipment in connection with gas burners shall be installed in accordance with the provisions of this Code.

(7) Installation in Residential Garages.

(a) Gas appliances may be installed on the floor of a residential garage provided a door of the garage opens to an adjacent ground or driveway level that is at or below the level of the garage floor. When this condition does not exist, appliances shall be installed so that the burners and pilots are at least 18 inches above the floor.

(b) Gas appliances shall be located or reasonably protected, so that they are not subject to physical damage by a moving vehicle.

(8) Installation in Commercial Garages.

(a) Floor mounted heaters in commercial garages for more than three motor vehicles shall be installed as follows:

(1) Heaters may be located in a room separated from other parts of the garage by construction having at least a one-hour fire resistance rating.

This room shall not be used for combustible storage and shall have no direct access from the garage storage or repair areas. All air for combustion purposes entering such a room shall be from outside of the building.

(2) Overhead heaters shall be installed at least 8 feet above the floor.

(3) Sealed combustion system heaters may be located within a garage. They shall be protected against physical damage.

(9) Installation in Aircraft Hangars. Heaters in aircraft hangars shall be installed in accordance with National Fire Protection Association. Standard on Aircraft hangars NFPA No. 409, Chapter 11., Hangar Services and Utilities — Section 1101 Heating.

Conversion Burners. Inputs Not Exceeding 400,000 BTU Per Hour. Installation of conversion burners shall conform to American Standard Installation of Domestic Gas Conversion Burners, ASA Z21-8, and to the applicable sections of this code.

Preparation of Existing Heating Appliance. Thoroughly clean the ash pit, fuel passages and combustion chamber of the furnace or boiler, removing all adhering tars, scale or dirt.

(1) If cracks or fractures, especially above the grate level, are found in any of the castings after they have been cleaned, the castings shall be replaced. Cracks or fractures in other materials shall be repaired or the parts replaced and the appliance made gas tight as shown by smoke bomb test or equivalent.

(2) All joints between sections shall be properly cemented and the ash pit tightly grouted to the floor. Openings for grate shaker bars, cracks around door frames, and cracks such as under clinker doors, shall be tightly sealed with furnace cement.

(3) Firing door catches shall be filed or otherwise altered so that the firing door will open easily to relieve pressure. Positive latches shall be removed from the appliance and replaced by either light sheet metal catches, a spring placed on the hinge pin to keep the door closed or an equivalent arrangement which will permit the door to open and relieve any excessive pressure which may occur in the furnace. Latches on firing doors shall hold such firing doors close to the frame without exposing or forming any cracks.

(4) Where the burner is installed at approximately grate level and the furnace is lined with a refractory material, this material shall be removed down to the level of the burner except where the refractory material forms the only wall between the combustion chamber and the furnace front shield.

(5) When inshot type conversion burners are installed in dry base boilers or gravity warm air furnaces the ash pit shall be lined for protection in accordance with the manufacturer's installation instructions, or as follows.

(a) With at least 2 inches of insulating fire brick which covers the ashpit bottom.

(b) With at least 2 inches of insulating fire brick along the side walls of the ash pit up to the level of the water backed surface of a boiler or sufficiently high to protect the grate lugs of a furnace.

(6) Where inshot type conversion burners are installed, the floor areas of a combustion chamber shall be in accordance with the burner manufacturer's

instructions or recommendations; however, in the absence of such instructions it shall be at least 1½ sq. in. per 1,000 BTU per hour input of the burner.

(7) The water column and gauge glass on a steam boiler shall be clean, with the water level plainly visible. The connections from gauge glass to boiler shall be free and unobstructed.

(8) The chimney shall be examined and thoroughly cleaned, if necessary, before installation is made.

Installation of Burner and Controls. The installation of gas conversion burners having inputs not exceeding 400,000 BTU per hour shall be installed in accordance with the following provisions.

(1) General. Gas conversion burners of all types shall consist of factory assembled and factory inspected units supplied with an automatic gas control valve, gas pressure regulator, manual main line shut-off valve, pilot shut-off valve, tubing or piping for pilot gas supply, tubing for bleed line from diaphragm valves when employed, and any automatic pilot wiring as regular equipment, and accompanied by complete and comprehensive installation and operation instructions. It shall be ascertained by close and careful inspection that parts of the unit are satisfactory and in proper working order and have not been bent, broken or otherwise damaged as the result of shipping or transporting the unit to the place of installation. It shall be determined that the unit has been manufactured for use with the gas and electricity to which it is to be connected.

Installation of a burner shall be so planned that it and all its controls will be readily accessible for inspection, cleaning, adjustment and repairs.

(a) The burner shall be solidly supported on fireproof material both front and rear and shall be level in both directions. No portion of the combustion air door opening of the burner shall be closed off by the seal covering the ash pit opening. Care shall be exercised when installing the burner to avoid undue strain on, or distortion of duct, or other components which would impair the fit, alignment or mechanical functioning of parts such as pilots, position of orifices with respect to venturi, combustion air door, etc.

(b) For drilled port or multi-jet upshot type conversion burners installed in boilers, the burner ports shall be at least one inch (1") above grate level. For single port upshot burners the above dimension shall apply to the bottom of the flame spreader.

(c) For drilled port or multi-jet upshot type conversion burners installed in warm air furnaces, the burner ports shall be set above the grate level but not more than ⅓ the distance between the grate and the bottom level of the firing door. For single port upshot burners the above dimension shall apply to the bottom of the flame spreader.

(d) Burners shall be so placed with respect to the firebox dimensions as to uniformly distribute the heat over as much of the available heating surface as possible.

(e) Where the burner is appreciably shorter than the firebox, it shall be placed at the end of the firebox which will insure the longest flue travel. In some instances, it may be necessary to install air directing baffles to insure proper distribution of combustion air within the flame zone and to thereby prevent floating flame conditions on one side of the burner.

(f) Firing door (fuel door) type burners shall be installed in accordance with the burner manufacturer's instructions. The burner ports shall be located with respect to the side walls of the combustion chamber so as to provide the longest travel for the products of combustion and to avoid direct flame impingement.

(g) After the supply line has been connected to the burner, close the space between the ash pit opening and the air duct (and/or air door shield) in a permanent manner which will preclude entrance of combustion air except through the air duct. The use of sheet metal or hard asbestos board neatly fitted will facilitate servicing at a later date.

(h) All gas burners installed in the revertible flue type of equipment exceeding a 12 inch downdraft shall be provided with a complete shut-off type automatic pilot unless equipped with adequate bleeder connections.

(2) Union for Connecting Burner to House Piping. A union shall be installed in the gas line downstream from the manual main shut-off valve.

(3) Automatic Main Gas-Control Valves. The automatic main gas-control valve shall be installed according to instructions furnished by the burner manufacturer.

(4) Gas Pressure Regulators. An approved gas pressure regulator shall be installed on all conversion burner installations. When automatic recycling ignition is used, the regulator shall not be vented into the combustion chamber. Regulators shall be in accordance with this code.

(5) Radiants and Flame Spreaders. All radiants or other refractory material, and flame spreaders employed on conversion burners shall be installed in accordance with the manufacturer's instructions.

Conversion Burners — Inputs Exceeding 400,000 BTU Per Hour.

Gas burners shall be in accordance with SBC 7901 and SBC 7902 and with the requirements of the administrative authority.

Dual Fuel Burners.

Dual fuel burners shall be in accordance with SBC 7901 and also with this section.

(1) Gas burners shall be of the inshot type and shall be installed to fire directly into the combustion chamber. Angle or corner installations will not be permitted without special permission from the office of the administrative authority.

(2) The installer shall be responsible for the proper functioning of both the gas equipment and the existing combustion facilities.

(3) Proper protection of the gas and other combustion equipment shall be provided from the effects of each other.

(4) Controls may be common to both fuels or may be independent. Transfer from one fuel to the other shall be by a manual interlock system to prevent the gas and other fuel being used simultaneously. SBC 7902(8) (d).

(5) Where it is necessary that both fuels are to be used simultaneously, special approval must be obtained from the Administrative Authority.

(6) The installer shall file with the administrative authority drawings showing electric wiring, gas piping, method of mounting burner and operating instructions.

Installation Requirements. Central Heating Boilers and Furnaces.

(1) Manual Main Shutoff Valves. When a complete shut-off type automatic pilot system is not utilized, a manual main shutoff valve shall be provided ahead of all controls except the manual pilot gas valve.

When a complete shutoff type automatic pilot ssytem is utilized, a manual main shutoff valve shall be provided ahead of all controls.

A union connection shall be provided downstream from the manual main shutoff valve to permit removal of the controls.

(2) Clearance.

(a) Central heating boilers and furnaces installed in rooms which are large in comparison with the size of the appliance, shall be installed with clearances not less than specified in Table 3 except as provided in (1), (2) and (3) following.

(1) Central heating furnaces and boilers listed for installation at lesser clearances than specified in Table 1 may be installed in accordance with their listing and the manufacturer's instructions.

(2) Central heating furnaces and boilers listed for installation at greater clearances than specified in Table 1, shall be installed in accordance with their listing and the manufacturer's instructions unless protected as specified in (3) following.

(3) Central heating furnaces and boilers may be installed in rooms, but not in confined spaces such as alcoves and closets, with reduced clearances to combustible material provided the combustible material or the appliance is protected as described in Table 4.

(b) Central heating furnaces and boilers may be installed in rooms, but not in confined spaces such as alcoves and closets unless they have been specifically listed for such installation and are installed in accordance with their listing. The installation clearances for furnaces and boilers in confined spaces shall not be reduced by the protection methods described in Table 2.

When the plenum is adjacent to plaster on metal lath or non-combustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish when the clearance specified is 2 inches or less.

The clearance to these appliances shall not interfere with the requirements for combustion air, draft hood clearance and relief, and accessibility for servicing.

TABLE No. 1

Clearances to Combustible Material for Furnaces and Boilers Installed in Rooms Which Are Large In Comparison With Size of Appliance, Except as Provided in 10.09 3 (a) (see note 9)

	Minimum Clearance, Inches				
	Above and Sides of Bonnet or Plenum	Jacket Sides And Rear	Front See Note 1	Project-ing Flue Box or Draft Hood	Vent Con-nector See Note 2
1. Listed automatically fired, forced air or gravity system with 250° F. temperature limit control.	2 See notes 3 and 4	6	18	6	6
2. Unlisted automatically fired, forced air or gravity system equipped with temp. limit control which cannot be set higher than 250° F.	6 See note 5	6	18	18 See note 6	18 See note 6
3. Listed Automatically Fired Heating Boilers-Steam Boilers operating at not over 15 psi gage pressure and hot water boilers operating at not in excess of 250° F.	6 See note 7	6	18	6	6
4. Unlisted Automatically Fired Heating Boilers-Steam boilers operating at not over 15 psi gage pressure and hot water boilers operating at not in excess of 250° F.	6 See note 7	6	18	18 See note 6	18 See note 6
5. Central heating boilers and furnaces, other than above.	18 See note 8	18	18	18 See note 6	18 See note 6

Notes applicable to Table 3.

1. Front clearance shall be sufficient for servicing the burner and furnace or boiler.

2. The vent connector clearance does not apply to listed Type B gas vents.

3. This clearance may be reduced to 1 inch for a listed forced air or gravity furnace equipped with:

a) A limit control that cannot be set higher than 200° F., or

b) A marking to indicate that the outlet air temperature cannot exceed 200° F.

4. Clearance from supply ducts within 3 feet of the plenum shall not be less than that specified from the bonnet or plenum. No clearance is required beyond this distance.

5. Clearance from supply ducts within 6 feet of the plenum shall not be less than 6 inches. No clearance is required beyond this distance.

6. For unlisted gas appliances equipped with an approved draft hood, this clearance may be reduced to 9 inches.

7. This clearance is above top of boiler.

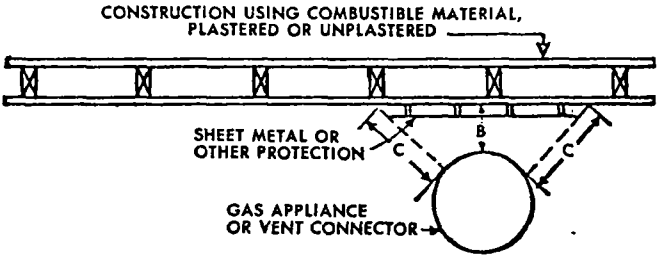
8. Clearance from supply ducts shall not be less than 18 inches out to 3 feet from the bonnet or plenum, not less than 6 inches from 3 feet to 6 feet, and not less than 1 inch beyond 6 feet.

9. Rooms which are large in comparison with the size of the appliance are rooms having a volumne equal to at least 12 times the total volume of a furnace and at least 16 times the total volume of a boiler. Total volume of furnace or boiler is determined from exterior dimensions and is to include fan compartments and burner vestibules, when used. When the actual ceiling height of a room is greater than 8 feet, the volume of a room shall be figured on the basis of a ceiling height of 8 feet.

TABLE NO. 2—CLEARANCE, INCHES, WITH SPECIFIED FORMS OF PROTECTION*

TYPE OF PROTECTION Applied to the combustible material unless otherwise specified and covering all surfaces w hin the distance specified as the required clearance with no protection. (See Fig. 1) Thicknesses are minimum.	WHERE THE REQUIRED CLEARANCE WITH NO PROTECTION IS:											
	36 in.			18 in.			12 in.		9 in.	6 in.		
	Above	Sides and Rear	Vent Connector	Above	Sides and Rear	Vent Connector	Above	Sides and Rear	Vent Connector	Above	Sides and Rear	Vent Connector
(a) ¾ in. asbestos millboard spaced out 1"**	30	18	30	15	9	12	9	6	6	3	2	3
(b) 28 gage sheet metal on ¼" asbestos milboard	24	18	24	12	9	12	9	6	4	3	2	2
(c) 28 gage sheet metal spaced out 1"**	18	12	18	9	6	9	6	4	4	2	2	2
(d) 28 gage sheet metal on ⅛" asbestos millboard spaced out 1"**	18	12	18	9	6	9	6	4	4	2	2	2
(e) 1½" asbestos cement covering on heating appliance	18	12	36	9	6	18	6	4	9	2	1	6
(f) ¼" asbestos millboard on 1" mineral wool bats reinforced with wire mesh or equivalent	18	12	18	6	6	6	4	4	4	2	2	2
(g) 22 gage sheet metal on 1" mineral wool bats reinforced with wire or equivalent	18	12	12	4	3	3	2	2	2	2	2	2
(h) ¼" asbestos cement board or ¼" asbestos mollboard	36	36	36	18	18	18	12	12	9	4	4	4
(i) ¼" cellular asbestos	36	36	36	18	18	18	12	12	9	3	3	3

*Except for the protection described in (e), all clearances shall be measured from the outer surface of the appliance to the combustible material disregarding any intervening protection applied to the combustible material.
**Spacers shall be of noncombustible material.



B equals the reduced clearance permitted in accordance with Table 4. The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.

Fig. 1. Extent of Protection Required to Reduce Clearances From Gas Appliances or Vent Connectors.

(3) Erection and Mounting. A central heating boiler or furnace shall be erected in accordance with the manufacturer's instructions and shall be installed on a floor of fire-resistive construction with noncombustible flooring and surface finish and with no combustible material against the underside thereof or on fire-resistive slabs or arches having no combustible material against the underside thereof unless listed for installation on a combustible floor, or the floor is protected in an approved manner.

(4) Plenum Chambers and Air Ducts.

(a) A plenum chamber supplied as a part of a furnace shall be installed in accordance with the manufacturer's instructions.

(b) When a plenum chamber is not supplied with the furnace, any fabrication and installation instructions provided by the manufacturer shall be followed. The method of connecting supply and return ducts shall facilitate proper circulation of air.

(c) When the furnace is installed within a confined space, the air circulated by the furnace shall be handled by ducts which are sealed to the furnace casing and are entirely separate from the means provided for supplying combustion and ventilation air.

(5) Refrigeration Coils.

(a) A refrigeration coil shall not be installed in conjunction with a forced air furnace when circulation of cooled air is provided by the furnace blower unless the blower has sufficient capacity to overcome the external static resistance imposed by the duct system and cooling coil for the air required for heating or cooling, whichever is greater.

(b) Furnaces shall not be located upstream from cooling units unless the cooling unit is designed or equipped so as not to develop excessive temperature or pressure.

(c) Refrigeration coils shall be installed in parallel with or on the downstream side of central furnaces to avoid condensation in the heating element unless the furnace has been specifically listed for downstream installation. With a parallel flow arrangement, the dampers or other means used to control flow of air shall be sufficiently tight to prevent any circulation of cooled air through the furnace.

(d) Adequate means shall be provided for disposal of condensate and to prevent dripping of condensate on the heating element.

(6) Cooling Units Used with Heating Boilers.

(a) Boilers, when used in conjunction with refrigeration systems, shall be installed so that the chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the heating boiler.

(b) When hot water heating boilers are connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation, such boiler piping systems shall be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

Installation Requirements. Room Heaters.

(1) Installation in Sleeping Quarters. Room heaters shall not be installed in bedrooms or sleeping quarters when such heaters depend upon air for combustion from the room in which they are located.

(2) Clearance. A room heater shall be placed so as not to cause a hazard to walls, floors, curtains, furniture, doors when open, etc., and to the free movements of persons within the room. Listed room heaters shall be installed with clearances not less than specified in Table 3, except that appliances listed for installation at lesser clearances may be installed in accordance with their listings. In no case shall the clearances be such as to interfere with the requirements of combustion air and accessibility.

Unlisted room heaters shall be installed with clearances from combustible material not less than the following:

(a) Circulating Type. Room heaters having an outer jacket surrounding the combustion chamber, arranged with openings at top and bottom so that air circulates between the inner and outer jacket, and without openings in the outer jacket to permit direct radiation, shall have clearance at sides and rear of not less than 12 inches.

(b) Radiating Type. Room heaters other than those described above as of circulating type shall have clearance at sides and rear of not less than 18 inches; except that heaters which make use of metal, asbestos, or ceramic material to direct radiation to the front of the appliance shall have a clearance of 36 inches in front, and if constructed with a double back of metal or ceramic may be installed with a clearance of 18 inches at sides and 12 inches at rear. Combustible floors under unlisted room heaters shall be protected in an approved manner.

TABLE No. 3

MINIMUM CLEARANCES FOR LISTED ROOM HEATERS

Types of Appliances	Distance from Combustible Material, Inches	
	Jacket, Sides and Rear	Projecting Flue Box or Draft Hood
Warm Air Circulators.....	6	2
Radiant Heaters	6	2
Wall Heaters	Flush	...

(3) Wall Type Room Heaters. Wall type room heaters shall not be installed in or attached to walls of combustible material unless listed for such installation.

(4) Air for Combustion and Ventilation. It shall be the installers responsibility to make provisions for adequate air for combustion and draft hood dilution.

Installation Requirements. Wall Furnaces.

(1) Wall furnaces shall be installed in accordance with their listing and the manufacturer's instructions. They may be installed in or attached to combustible material.

(2) Vented wall furnaces connected to a Type BW gas vent system listed only for single story shall be installed only in single story buildings or the top story of multi-story buildings. Vented wall furnaces connected to a Type BW gas vent system listed for installation in multi-story buildings may be installed in single story buildings. Type BW gas vents shall be attached directly to a solid header plate which may be an integral part of the vented wall furnace, and which serves as a fire stop at that point. The stud space in which the vented wall furnace is installed shall be ventilated at the ceiling level by installation of the ceiling plate spacers furnished with the gas vent. (See Figure 1 for Type BW gas vent installation requirements.)

(3) Sealed combustion system wall furnaces shall be installed with the vent-air intake terminal in the outside atmosphere. The thickness of the walls on which the appliance is mounted shall be within the range of wall thickness marked on the appliance and covered in the manufacturer's instructions for installation.

(4) Panels, grilles, and access doors which must be removed for normal servicing operations shall not be attached to the building.

(5) Location. Wall furnaces shall be located so as not to cause a hazard to walls, floors, curtains, furniture, or doors. Wall furnaces installed between bathrooms and adjoining rooms shall not circulate air from bathrooms to other parts of the building.

(6) Manual Main Shutoff Valve. A manual main shut-off valve shall be installed ahead of all controls including the pilot gas valve.

(7) Combustion and Circulating Air. Adequate combustion and circulating air shall be provided.

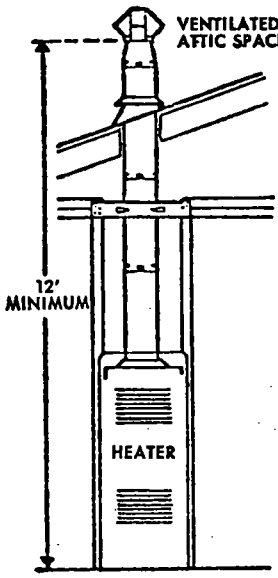
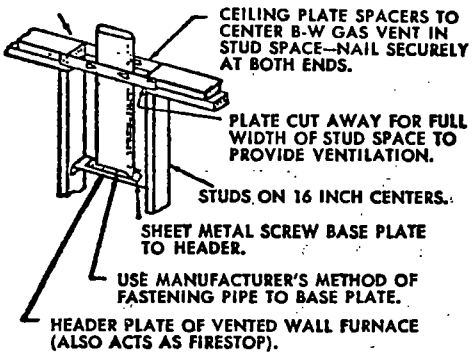


Figure 1a.

INSTALLATION OF B-W GAS VENT FOR ONE STORY BUILDINGS OR FOR TOP FLOOR OF MULTISTORY BUILDINGS.



Installation of Type B-W Gas Vents for Vented Wall Furnaces.

Installation Requirements. Floor Furnaces.

(1) Installation. Floor furnaces may be installed in combustible floors.

(2) Manual Main Shutoff Valve. A separate manual main shutoff valve shall be provided ahead of all controls and a union connection shall be provided downstream from this valve to permit removal of the controls or the floor furnace.

(3) Combustion and Circulating Air. Adequate combustion and circulating air shall be provided.

(4) Placement. The following requirements apply to furnaces to serve one story:

(a) Floor furnaces shall not be installed in the floor of any aisle or passageway of any auditorium, public hall, or place of assembly, or in an exitway from any such room or space.

(b) Walls and Corners. The grille of a floor furnace with a horizontal warm air outlet shall not be placed closer than 6 inches to the nearest wall. A distance of at least 15 inches from two adjoining sides of the floor grille to walls shall be provided to eliminate the necessity of occupants walking over the warm air discharge from grilles. Wall-register models shall not be placed closer than 6 inches to a corner.

(c) Draperies. The furnaces shall be placed so that a door drapery, or similar object, cannot be nearer than 12 inches to any portion of the register of the furnace.

(d) Central Location. The furnace should be installed in a central location favoring slightly the sides exposed to the prevailing winter winds.

(5) Bracing. The space provided for the furnace shall be framed with doubled joists and with headers not lighter than the joists.

(6) Support. Means shall be provided to support the furnace when the floor grille is removed.

(7) Clearance. The lowest portion of the floor furnace shall have at least a 6 inch clearance from the general ground level, except that when the lower 6 inch portion of the floor furnace is sealed by the manufacturer to prevent entrance of water, the clearance may be reduced to not less than 2 inches. When these clearances are not present, the ground below and to the sides shall be excavated to form a "basin-like" pit under the furnace so that the required clearance is provided beneath the lowest portion of the furnace. A 12 inch clearance shall be provided on all sides except the control side, which shall have an 18 inch clearance.

(8) Access. The space in which any floor furnace is installed shall be accessible by an opening in the foundation not less than 24 by 18 inches or a trap door, not less than 24 by 24 inches in any cross section thereof, and a passageway not less than 24 by 18 inches in any cross section thereof. The serving gas supplier should be consulted with reference to the access facilities for servicing when it provides service.

(9) Seepage Pan. When the excavation exceeds 12 inches in depth or water seepage is likely to collect, a watertight copper pan, concrete pit or other suitable material shall be used, unless adequate drainage is provided or the equipment is sealed by the manufacturer to meet this condition. A copper pan shall be made of not less than 16 ounce per-square-foot sheet copper. The pan shall be anchored in place, so as to prevent floating, and the walls shall extend at least 4 inches above the ground level, with at least 6 inches clearance on all sides except the control side, which shall have at least 18 inches clearance.

(10) Wind Protection. Floor furnaces shall be protected, where necessary, against severe wind conditions.

(11) Upper Floor Installations. Floor furnaces may be installed in an upper floor provided the furnace assembly projects below into a utility room, closet, garage, or similar nonhabitable space. In such installation, the floor furnace shall be enclosed completely with means for air intake and with access for servicing with minimum furnace clearances of 6 inches to all sides and bottom, and with the enclosure constructed of portland cement plaster on metal lath or material of equal fire resistance.

(12) First Floor Installations. Listed floor furnaces installed in the first or ground floors of buildings need not be enclosed unless the basements of these buildings have been converted to apartments or sleeping quarters, in which case the floor furnace shall be enclosed as specified for upper floor installations and shall project into a nonhabitable space.

Installation Requirements. Duct Furnaces.

(1) Clearance.

(a) Listed duct furnaces shall be installed with clearances of at least 6 inches between adjacent walls, ceilings, and floors of combustible material and the appliance projecting flue box or draft hood, except that duct furnaces listed for installation at lesser clearances may be installed in accordance with their listings. In no case shall the clearance be such as to interfere with the requirements for combustion air and accessibility.

(2) Erection of Appliances. Duct furnaces shall be erected and firmly supported in accordance with the manufacturer's instructions.

(3) Access Panels. The ducts connected to duct furnaces shall have removable access panels on both the upstream and downstream sides of the furnace.

(4) Location of Draft Hood and Controls. The controls, combustion air inlet, and draft hoods for duct furnaces shall be located outside the ducts. The draft hood shall be located in the same enclosure from which combustion air is taken.

(5) Circulating Air. When a duct furnace is installed in a confined space, the air circulated by the furnace shall be handled by ducts which are sealed to the furnace casing and which separate the circulating air from the combustion and ventilating air.

(6) Duct Furnaces Use with Refrigeration Systems.

(a) A duct furnace shall not be installed in conjunction with a refrigeration coil when circulation of cooled air is provided by the blower unless the blower has sufficient capacity to overcome the external static resistance imposed by the duct system, furnace, and the cooling coil for the air required for heating or cooling whichever is greater.

(b) To avoid condensation within heating elements, duct furnaces used in conjunction with cooling equipment shall be installed in parallel with or on the upstream side of cooling coils unless the duct furnace has been specifically listed for downstream installation. With a parallel flow arrangement, the dampers or other means used to control the flow of air shall be sufficiently tight to prevent any circulation of cooled air through the unit.

(c) When duct furnaces are to be located upstream from cooling units, the cooling unit shall be so designed or equipped as to not develop excessive temperatures or pressures.

(d) Duct furnaces may be installed downstream from evaporative coolers or air washers if the heating element is made of corrosion-resistant material. Stainless steel, ceramic-coated steel, or an aluminum-coated steel in which the bond between the steel and the aluminum is an iron-aluminum alloy, are considered to be corrosion-resistant. Air washers operating with chilled water which delivers air below the dew point of the ambient air at the appliance are considered as refrigeration systems.

Installation Requirements. Unit Heaters.

(1) Support. Suspended type unit heaters shall be safely and adequately supported with due consideration given to their weight and vibration characteristics. Hangers and brackets shall be of noncombustible material.

(2) Clearance.

(a) Suspended Type Unit Heaters.

(1) Listed unit heaters shall be installed with clearance from combustible material of not less than 18 inches at the sides, 12 inches at the bottom, and 6 inches above the top when the unit heater has an internal draft hood.

(2) Unit heaters listed for reduced clearances may be installed in accordance with the clearance marked on the unit which will require not less than 6 inches from the draft hood relief opening, and 6 inches above an elbow attached directly to the draft hood outlet.

(3) Unlisted unit heaters shall be installed with clearance to combustible material of not less than 18 inches.

(4) Additional clearances required for servicing shall be in accordance with the manufacturer's recommendations contained in the installation instructions.

(b) Floor mounted Type Unit Heaters.

(1) Listed unit heaters shall be installed with clearance from combustible material at the back and one side only of not less than 6 inches. When the flue gases are vented horizontally the 6 inch clearance shall be measured from the draft hood or vent instead of the rear wall of the unit heater.

(2) Unit heaters listed for reduced clearances may be installed at the clearances marked on the unit from the back, two side walls, and ceiling. Walls and ceiling will be required to have at least 6 inches clearance from the draft hood relief openings and the nearest point of the draft hood exterior to the unit.

(3) Floor mounted type unit heaters may be installed on combustible floors if listed for such installation.

(4) Combustible floors under unlisted floor mounted unit heaters shall be protected in an approved manner.

(5) Additional clearances required for servicing shall be in accordance with the manufacturer's recommendations contained in the installation instructions.

(3) Combustion and Circulating Air. Adequate combustion and circulating air shall be provided.

(4) Ductwork. A unit heater shall not be attached to a warm air duct system unless listed and marked for such installation.

Installation Requirements. Infra Red Heaters.

(1) Support. Suspended type infra-red radiant heaters shall be safely and adequately fixed in position independent of gas and electric supply lines. Hangers and brackets shall be of noncombustible material.

(2) Clearance.

(a) Listed heaters shall be installed with clearances from combustible material of not less than shown on the marking plate and in the manufacturer's instructions.

(b) Unlisted heaters shall be installed in accordance with clearances from combustible material acceptable to the administrative authority.

(3) Combustion and Ventilating Air. Mechanical exhaust shall be provided in the quantity recommended by the manufacturer and be sufficient to prevent condensation in the space to be heated. Heaters shall be installed so they will not operate until the exhaust air quantity has been proved. Provisions shall be made for make-up air in the space to be heated.

Installation Requirements. Direct Gas Fired Air Heaters.

(1) Listed direct gas-fired heaters shall be installed in accordance with their listing and the manufacturer's instructions.

(2) They shall conform to the following requirements and provisions.

(3) All burners must be positively ignited and safely supervised. No runners or flash tubes will be permitted for burner ignition.

(4) Under no condition of burner or pilot stoppage shall such equipment discharge unburned gas into the air stream. Burners must ignite or shut off on safety.

(5) Flame safety controls shall be used which will shut off the fuel supply within five (5) seconds in case of flame failure. Flame safety controls must fail in the safe position. For units with inputs under 400,000 BTU a flame safety control which will shut off the fuel supply within sixty (60) seconds will be acceptable.

(6) The air supply to be heated must be proved before the pilot can be ignited or main burner valve is allowed to open. Provisions shall be made to shut off the fuel supply in the event of fan air failure or reduction in fifty per cent (50%) in air flow.

(7) If outside air closing louvers of either the manual or automatic type are used, the damper must be proved in the open position before the pilot can be ignited or the gas burner can operate.

(8) Proper limit controls shall be provided to limit maximum air temperatures within the unit and shall be provided a limit control to limit the discharge air temperature to one hundred fifty (150° F.) degrees. A low temperature limit control shall be installed in the discharge air stream which will shut off the outside air supply in the event the discharge air temperature falls below forty (40° F.) degrees.

(9) Main burners which are subdivided into sections or zones shall be so interlocked that the gas supply to the burner adjacent to the pilot must be served first and adjacent burners sequenced so that they positively ignite from each other in proper order.

(10) Air velocity through or over the burner flames shall not adversely affect the combustion of the gas at the burner heads. A rise in concentration of carbon monoxide between the inlet and the outlet air through the heater shall not exceed ten (10) P.P.M. under all burner firing rates.

(11) Equipment shall be rated as to its capacity in cubic feet per minute of air raised one hundred degrees (100° F.) in temperature at a given BTU input to the burners. Such equipment must deliver the manufacturer's rating at the established air temperature rise and BTU input.

(12) The units shall be capable of maintaining the required discharge air temperature within plus or minus five degrees (5°) F. of the control setting irrespective of the outside temperature. The uniformity of the discharge air temperature shall be within thirty degrees (30°).

(13) The installer shall submit plans showing the proposed installation indicating the location of the heater and such accessories as may be required to insure the proper and safe performance of its function.

(14) Direct gas fired heaters shall use one hundred per cent (100%) outside air for the air to be heated. Combustion air not exceeding one cubic foot (1 cu. ft.) per one hundred (100) BTU may be taken from the room.

(15) All air passing through or over the burners shall be outside air and screened or filtered to prevent leaves, papers, or other objects from being picked up from the outside, ignited, and discharged into the heated space.

(16) Direct gas fired heaters shall be erected and firmly supported in accordance with the manufacturer's instructions.

Installation Requirements. Air Conditioners. Gas.

(1) Connection of Gas Engine-Powered Air Conditioners. To protect against the effects of normal vibration in service, gas engines shall not be rigidly connected to the gas supply pipings.

(2) Manual Main Shutoff Valves. When a complete shut-off type automatic pilot system is not utilized, a manual main shutoff valve shall be provided ahead of all controls except the manual pilot gas valve.

When a complete shutoff type automatic pilot system is utilized, a manual main shutoff valve shall be provided ahead of all controls.

A union connection shall be provided downstream from the manual main shutoff valve to permit removal of the controls.

(3) Clearances for Indoor Installation.

(a) Listed air conditioning appliances installed in rooms which are large in comparison with the size of the appliance, shall be installed with clearances not less than specified in Line 1 of Table 1 except as provided in the following:

(1) Air conditioning appliances listed for installation at lesser clearances than specified in Table 1 may be installed in accordance with their listing and the manufacturer's instructions.

(2) Air conditioning appliances listed for installation at greater clearances than specified in Table 1 shall be installed in accordance with their listing and the manufacturer's instructions unless protected as specified in (3) following. However, when clearances are specified to provide access for service, they shall not be reduced.

(3) Air conditioning appliances may be installed in rooms, but not in confined spaces such as alcoves and closets, with reduced clearances to combustible material provided the combustible material or the appliance is protected as described in Table 2. However, when clearances are necessary or specified to provide access for service, they shall not be reduced.

(b) Air conditioning appliances shall not be installed in confined spaces such as alcoves and closets unless they have been specifically listed for such installation and are installed in accordance with their listing. The installation clearances for air conditioning appliances in confined spaces shall not be reduced by the protection methods described in Table 2.

When the plenum for an air conditioner which includes provisions for heating air is adjacent to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish when the clearance specified is 2 inches or less.

The clearance to these appliances shall not interfere with the requirements for combustion air, draft hood clearance and relief, and accessibility for servicing.

(c) Unlisted air conditioning appliances shall be installed with clearances from combustible material of not less than 18 inches above the appliance and at sides, front, and rear, and 9 inches from projecting flue box or draft hood.

SBC 7904 Venting Gas Burners. The venting of gas burners shall be in accordance with this section of this chapter and the applicable sections of Chapter 74 of this Code.

Types of Flues or Vents Defined. For the purposes of the Code, the following definitions shall apply.

TYPE A FLUE OR VENT. Flues or vents of masonry, reinforced concrete, or metal smoke stacks approved for use with solid or liquid fuels.

TYPE B GAS FLUE OR VENT. Vent piping of noncombustible corrosion-resistant material of sufficient thickness, cross-sectional area, and heat insulating quality to avoid excess temperature on adjacent combustible material and certified by a nationally recognized testing agency.

TYPE C GAS FLUE OR VENT. Flue or vent piping of sheet copper of not less than No. 24 U.S. Standard gauge or of galvanized iron or aluminum of not less than No. 20 U.S. Standard gauge or of other approved corrosion-resistant material.

CHIMNEY LINER. A vent pipe or flue inserted within a type A flue or vent for the purpose of minimizing condensation of flue products and preventing such condensation from contact with the interior of the type A flue or vent in which it is inserted.

FLUE OR VENT. A conduit or passageway, vertical or nearly so, for conveying flue gases to the outer air.

FLUE OR VENT CONNECTOR. The pipe connecting an appliance with the flue or vent. This corresponds to the smoke pipe used with solid or liquid fuels.

DRAFT HOOD. A device built into an appliance, or made a part of the flue or vent connector from an appliance, which is designed to (1) insure the ready escape of the products of combustion in the event of no draft, back draft, or stoppage beyond the draft hood; (2) prevent a back draft from entering the appliance; and (3) neutralize the effect of stack action of the flue or vent upon the operation of the appliance.

Draft Hoods.

Every vented appliance except units designed for forced venting or those using barometric dampers shall be provided with a draft hood. If the draft hood is not a part of the appliance or supplied by the appliance manufacturer, it shall be supplied by the installer and, in the absence of other instructions, shall be the same size as the appliance flue collar. However, the flue collar of a boiler or furnace fired by a conversion burner may be reduced in size by means of a tapered reducer to that size required by the input to the conversion burner.

(1) Installation. Where the draft hood is a part of the appliance or is supplied by the appliance manufacturer it shall be installed without alteration in accordance with the manufacturer's instructions. In the absence of the manufacturer's instructions the draft hood shall be attached to the flue collar of the appliance or as near to the appliance as conditions permit. In no case shall a draft hood be installed in a false ceiling, in a different room, or in any manner that will permit a difference in pressure between the draft hood relief opening and the combustion air supply.

(2) Position. A draft hood shall be installed in the position for which it was designed with reference to the horizontal and vertical planes and shall be so located that the relief opening is not obstructed by any part of the appliance or adjacent construction.

(3) Special Draft Hoods. Where, due to unusual conditions, the installer must supply a draft hood of special design, its design, construction and installation shall be subject to the approval of the administrative authority.

Barometric Dampers.

(1) An approved draft regulator having a minimum free area of ¾ of the area of the boiler or furnace breeching outlet may be used in lieu of a draft hood.

Where barometric dampers are used they shall furnish positive and effective protection against back drafts and shall have means to shut off the main gas supply in the event of a down draft. Barometric dampers shall be installed in accordance with the manufacturer's instructions.

Internal Draft Dampers.

Uptake dampers shall be counter-balanced to open in the event of breakage or failure of their operating means. Counter-balancing arms, weights, etc. shall be so located or shielded as to prevent personal injury or damage to equipment in case of breakage.

(1) For automatically lighted burners, automatically operated dampers, where used, shall be interlocked to prevent lighting of the main burner unless sufficient draft is available.

(2) All combustion control systems shall be so installed as to assure stable, safe and approved proper standards of combustion and efficiency with a minimum of 70% for the required range of operation. The sequence of operation of automatic damper controls shall be subject to the approval of the administrative authority.

(3) When air louvers, dampers or other air controls are automatically operated, such operation shall be in conjunction with gas input control valves, either by mechanical linkage or changes in furnace pressure and/or change in fuel flow to maintain proper fuel-air ratio over the entire required range of operation. The operating medium may be electrical, pneumatic or hydraulic. Arrangements shall be provided for shutting off the fuel supply in the event of a failure of the control medium.

Types of Flues, or Vents, Use of.

Type A flues or vents shall be employed for venting:

(1) All appliances which may be converted readily to the use of solid or liquid fuels;

(2) All boilers and warm air furnaces except where approved for connection to type B gas flue or vents.

(3) All incinerators.

Type B Vents:

(a) Type B gas flues or vents shall be used only with an approved gas designed appliances which produce flue gas temperatures not in excess of 550 degrees F. at the outlet of the draft hood when burning gas at the manufacturer's normal input rating and not specified by this section to be vented to Type A flues or vents.

For the purposes of this Code, approved gas design appliances, with the exception of incinerators and conversion burners, may be accepted as pro-

ducing flue gas temperatures not in excess of 550 degrees F. at the outlet of the draft hood.

A condensation pocket shall be provided at the base of such type B flue or vent with provision for a drip, so arranged that excessive condensation of flue products may be disposed of without damage to the foundation, floor, walls or footings.

If rainwater cannot be allowed in a vent and a cap must be used, such cap should have as little cooling surface as possible, be screened with visible ½ inch mesh screen, be corrosion proof (aluminum or galvanized steel), installed so the clearance between the vent cap and end of vent is equal to vent diameter, and so constructed and installed that it is impossible for the cap to slip down over the vent.

Marking of Gas Flues or Vents not Suitable for Other Fuels.

Chimneys, flues or vents installed for use with gas appliances but which are not suitable for solid or liquid fuels, shall be plainly and permanently labeled: "This flue is for use of gas burning appliances only."

The label shall be attached to the wall or ceiling at a point near where the flue or vent connector enters the chimney, or, where a type B gas flue or vent is used in place of a chimney, at a point near where the type B gas flue or vent or the flue or vent connector enters the wall or ceiling.

(1) Type C gas flues or vents shall be used for runs directly from the space in which the appliance is located through the roof or exterior wall to the outer air. Such flues or vents shall not pass through any attic or concealed space nor through any floor. Installation with reference to clearance to combustible construction and passage through wall or roof shall comply with the provisions of paragraphs.

Venting. Chimney Liners.

When the administrative authority requires a metal flue liner such liner shall comply with SBC 7402 of Chapter 74. A chimney liner release will be granted when the administrative authority finds it impossible to install a liner.

Venting. Flue Size.

(1) Sizing Vent Pipe. The vent pipe or connection should not be smaller than the size indicated by the vent pipe collar of the appliance and not less than one square inch in cross sectional area for each 7,500 BTU per hour input to appliance. However, in no case shall the vent from any appliance be less than 3 inches in diameter.

Two or more gas appliances may be vented through a common flue or vent connector when necessary, if the area of the common flue or vent connector is equal to or greater than 1 square inch in cross-sectional area for each 7,500 BTU per hour input of the individual gas appliances.

Individual gas appliance vents shall join the common vent by Y fittings. Tables 1, 2, 4, and 5 of Chapter 74 will be the minimum standards for sizing of vents.

Where high chimneys create high draft intensities, deviations from the foregoing table to the extent of practicability may be permitted by the administrative authority.

Where mechanical draft is applied, vent size shall be determined upon capacity and type of equipment, all subject to approval by the administrative authority. Where high temperatures are encountered, fan or blower construction shall be so designed as to safely operate under those temperatures.

Class B vent flues shall have a venting capacity of at least 50,000 BTU input greater than the input of the central heating gas appliance which it serves and shall in no case be less than 5 inches inside diameter.

Venting. Insufficient Draft.

In the event conditions at the time of installation are such that the chimney or vertical flue has insufficient natural draft to properly carry away the products of combustion, provision shall be made by the installer to rectify existing conditions or provide mechanical means of maintaining constant up draft during appliance operation. The draft must be proved before the burner may be operated.

SBC 7905 Tests. Burner Operation. Appliance Performance. General.

(1) Placing Equipment in Operation. Immediately upon completion of all installations the installer shall test all safety shut-off, operating controls and venting before placing the burner in service. The correct input of gas should be determined and the fuel-air ratio set.

(a) Adjusting the Burner Input; Tests. Each burner shall be adjusted to its proper input in accordance with the manufacturer's instructions. Overrating of burners is prohibited.

(1) Gas Designed Equipment. The rate of flow of the gas shall be adjusted to within plus or minus 2% of the required hourly BTU rating at the manifold pressure specified by the manufacturer. When the prevailing pressure is less than the manifold pressure specified, the gas rates shall be adjusted at the prevailing pressure.

(2) Conversion Burners. For conversion burners installed in hot water boilers or warm air furnaces the rate of flow of the gas in BTU per hour shall be adjusted to within plus or minus 5% of 1.7 times the calculated hourly BTU heat loss of the building in which it is installed.

(3) For conversion burners installed in steam boilers the gas hourly input demand shall be adjusted to meet the steam load requirements. In case of over-sized boiler having rating in excess of load requirements, the gas input demand necessitated by such oversized boiler shall be established and added to the input demand for load requirements to arrive at total input demand.

(b) Pilot Operations. Pilot flames shall be effective to ignite the gas at the main burner or burners and shall be adequately protected from drafts.

(1) Pilot flames shall not become extinguished when the main burner or burners are turned on or off in a normal manner, either manually or by automatic controls.

(2) Luminous flame pilots shall not show carbon deposits when adjusted according to the manufacturer's instructions.

(3) Where escapement pilots are used, their flames shall be freely ignited by the constant burning pilot.

(c) Burner Operation. In making the tests to determine compliance with this section, care shall be exercised to prevent the accumulation of unburned gas in the appliance or flues which might result in explosion or fire.

(1) The flames from each burner shall freely ignite the gas from adjacent burners when operating at the prevailing gas pressure or when the main control valve is regulated to deliver about ⅓ the full gas rate.

(2) Burner flames shall not flash back upon immediate ignition, nor upon turning the gas cock until the gas rate to the burner is about ⅓ the full supply.

(3) Burner flames shall not flash back when the gas is turned on or off by any automatic control mechanism.

(4) Main burner flames shall ignite freely from each constant burning pilot when the main control valve is regulated to about ⅓ the full gas rate or when pilot flame is reduced to minimum point at which it will actuate the safety thermostatic device.

(5) When ignition is made in a normal manner the flame shall not flash outside the appliance.

(6) Burners shall not expel gas through air openings in mixer faces when operating at the prevailing pressure.

(d) Appliance Performance. The concentration of oxygen in the flue products of conversion burners shall, in no case, be less than 4% nor less than 10%. The allowable limit of C.O. shall not exceed .04%. The flue gas temperature of gas designed appliances, as taken on the appliance side of the draft hood, shall not exceed 480° F. above that of the room air temperature surrounding the appliance.

(1) Method of Test. The appliance shall be allowed to operate until the stack temperature becomes stabilized, after which a sample of the flue products shall be taken at a point in the flue after the outlet of the appliance but ahead of the draft hood and analyzed for carbon dioxide and carbon monoxide. When carbon dioxide and carbon monoxide samples of combustion products have been analyzed an oxygen determination can be made from a combustion scale or chart.

(2) The venting and various controls of the appliance shall be checked by the installer to insure their proper operation.

(3) Upon completion of the test of any newly installed gas burning equipment as hereinabove provided in this section, the installer shall file with authority complete records of such test including report of smoke bomb test of warm air furnace. A tag stating the date of test and name of tester shall be attached to the appliance.

(e) Instructions to the Customer. The customer shall be thoroughly informed by the installer as to the proper and safe operation of the appliance before it is placed in continuous service.

(f) The wiring diagram of the installation and suitable operating instructions shall be supplied and posted near the boiler or furnace.

(1) In the absence of the customer, printed instructions enclosed in an envelope labeled "Instructions to Customers" and attached to the main shutoff valve of the appliance by the installer, shall be construed as having fulfilled the aforementioned requirements.

(2) A metallic plate, suitably etched or stamped, setting forth detailed instructions for the safe lighting and shutting off of the appliance shall be permanently attached to the appliance in a prominent position near the lighting apertures. The size of type used shall be not smaller than 10 point and the wording contained thereon shall be subject to the approval of the administrative authority.

SBC 8001 GAS PIPING. Approval of Materials and Appliances. No person shall install any material to connect same to any gas system, which material has not been approved by the administrative authority.

The administrative authority shall accept for installation any appliance or material which has been listed by a recognized national testing laboratory, until such time as experience in the field of actual service developing unforeseen factors warranting withdrawal of acceptance.

SBC 8002 Gas Piping Material, Connection. All pipe used for the distribution of natural or liquid petroleum gas shall be steel, wrought iron, copper or brass of full weight standard gauge and thickness. Steel and wrought iron pipe shall comply with A.S.A. B36.10. Steel and wrought iron piping run outside exposed above ground shall be galvanized, painted, or coated with an approved rust resistant material.

All steel and wrought iron pipe 2½ inch and larger shall be welded. Fittings on screw or flange piping, (except stopcocks and valves) shall be malleable iron, wrought iron or steel.

Copper tubing or approved steel tubing shall be of standard type K or L or equivalent, complying with A.S.T.M. B88 and having a minimum wall thickness for each tubing size in compliance with A.S.T.M. specifications. Joints shall be made by approved flared gas fittings or by brazing with a material having a melting point in excess of 1000° F. Compression type fittings shall not be used for this purpose. Copper or iron tubing shall not be used for piping within the burner heat zone to pilot burners.

SBC 8003 Flexible Gas Tubing Connections. No person shall install, use or maintain flexible gas connections between gas burning devices and the supply piping except on specific approval of the administrative authority. When a flexible connection is made, a shut off valve must always be provided at the end where the flexible connector is attached to the rigid piping.

SBC 8004 New Materials. Any materials may be permitted other than as specified in this Code, if the administrative authority approves such materials as being of the same quality and performance as the material specified herein.

SBC 8005 Defective Pipe and Fittings. Defects in pipe or fittings shall in no case be repaired. All such defective pipe or fittings shall, when located, be removed and replaced with perfect material. All pipe and fittings shall be of perfect material, all pipe ends shall be reamed free of burrs and welding slag.

SBC 8006 Construction and Installation, Generally. All piping installed for the distribution of natural or liquid petroleum gas shall be so constructed and installed as to be durable, substantial and gas tight. It shall be run substantially square with the building construction in a neat orderly fashion.

SBC 8007 Piping Supports. Gas piping in buildings shall be supported with pipe hooks, metal pipe straps, bands or hangers suitable for the size of piping, and of adequate strength and quality and located at proper intervals

so the piping cannot be moved accidentally from the installed position. Gas piping shall not be supported by or used to support other piping. Spacing of supports in piping installations shall not be greater than the following:

⅜ inch	4 feet
½ inch	6 feet
¾ inch or 1 inch	10 feet

Vertical piping shall be supported at every floor by a specific means of support.

SBC 8008 Outside Exposed Piping. Gas piping may be run inside or outside the building regardless of temperature changes. Provision shall be made to allow for expansion and contraction of the piping.

SBC 8009 Drips. Condensate drips are not required when using natural or liquid petroleum gas.

A tee fitting with the bottom outlet plugged or capped shall be installed at the base of supply piping when dropping down to an automatically controlled gas burner or appliance, where dirt or foreign material could cause an automatic gas valve to malfunction.

SBC 8010 Pipe Threads

(1) SPECIFICATIONS FOR PIPE THREADS. Pipe and fitting threads shall comply with the American Standard for Pipe Threads (except Dryseal), B 2.1.

(2) DAMAGED THREADS. Pipe with threads which are stripped, chipped, corroded, or otherwise damaged shall not be used.

(3) NUMBER OF THREADS. Pipe shall be threaded in accordance with Table 3.

SPECIFICATIONS FOR THREADING PIPE

Iron Pipe Size (Inches)	Approximate Length of Threaded Portion (Inches)	Approximate No. of Threads to be Cut
½	¾	10
¾	¾	10
1	⅞	10
1¼	1	11
1½	1	11
2	1	11
2½	1½	12
3	1½	12
4	1⅝	13

SBC 8011 Bending Prohibited. Pipe shall not be bent. Fittings shall be used when making turns in the gas piping. Proper bends will be allowable with copper tubing.

SBC 8012 Joint Compounds. Joint compounds (pipe dope) shall be applied sparingly and only to the male threads of pipe joints. Such compounds shall be resistant to the action of liquified petroleum gases.

SBC 8013 Structure Protection. The building structure shall not be weakened by the installation of any gas piping. Before the beams or joists are cut or notched, special permission shall be obtained from the administrative authority.

SBC 8014 Piping Protection. Pipes passing through concrete, or other corrosive materials, shall pass through sleeves, casings or be suitably coated to protect against corrosion and mechanical damage.

SBC 8015 Restricted Pipe Runs. Gas pipes inside any building shall not be run in or through an air duct, clothes chute, chimney or flue, ventilating duct, dumb waiter or elevator shaft or be run in false ceilings when the space is used as an air plenum. Pipe shafts specifically designed for this purpose will be acceptable.

SBC 8016 Restrictions on Concealed Piping. Piping run in inaccessible or concealed spaces in or under buildings shall be constructed and installed to prevent a hazardous accumulation of gas. Concealed piping in walls should be located in hollow rather than solid partitions.

Piping run underground inside the building, or run in solid floors such as concrete, shall be run in conduits or casings. Piping may be laid in channels in the floor that have removable covers to permit access to the piping with a minimum of damage to the building. Such casings, conduits or channels shall be left open into an accessible location or be vented so a leak will be readily detected.

Piping run underground inside the building and extending underground outside the building shall be encased in a gas-tight conduit. The conduit shall extend into a normally usable and accessible portion of the building and at the point where the conduit terminates in the building, the space between the conduit and gas pipe shall be sealed to prevent the possible entrance of any gas leakage. The conduit shall be vented above grade to the outside and the vent terminal shall be screened and hooded to prevent accidental closure. The conduit shall extend at least four inches (4") beyond the outside building wall or any adjacent paved area, except the conduit need not exceed ten feet (10') in distance from the building under any paved area. The space between the gas pipe and the conduit at the underground end shall be left open.

Concealed tubing run through joists, studs, plates, or other wood construction within 2 inches of the rough surface, shall be protected from physical damage by steel plates or sleeves of at least 20 gauge thickness.

Unions, flared or compression fittings, running threads, right and left couplings, or bushings shall not be used on concealed gas piping inside the building.

SBC 8017 Depth of Piping Outside Underground. Any gas piping to be run underground outside the building shall have not less than 6 inches of ground cover unless otherwise approved by the administrative authority.

SBC 8018 Piping Underground Outside. Any gas piping to be run underground outside the building shall be copper, steel, or wrought iron.

Steel or wrought iron pipe shall have an approved outside protective coating of polyethylene, polyvinyl, or its equivalent of 10 mil thickness or greater. The pipe shall not be threaded, but shall be joined by welding or mechanical joints, and such joints shall be suitably wrapped with an approved protective coating.

SBC 8019 Meter Location

(1) The meter location shall be such that the meter can be easily read and the connections are readily accessible for servicing. Location, space requirements, dimensions, and type of installation shall be acceptable to the servicing gas supplier.

SBC 8020 Meter Support. Meters shall be adequately supported from the structure or shall be on a substantial slab and so connected to the piping as not to exert undue strain on the connection.

SBC 8021 Meter Room Ventilation. Meter room shall be ventilated, when necessary, through adequate grills in doors, walls or local ventilation to outer air. Grills in doors or walls shall not be open into building interiors.

SBC 8022 Main Gas Supply Shut-off. When meters are installed inside the building, a main shut-off valve shall be installed in a readily accessible location inside the building on the street side of the meter.

When meter or meters are installed on the exterior of the building walls, a main shut-off valve, same size as the main building gas supply shall be installed on the inside of the building between the meter and the first branch gas line. This shut-off valve shall be installed in the first readily accessible location for use and operation and shall have a permanently attached handle. In multiple dwellings this main shut-off valve shall not be located in an apartment or locked room, but shall be in the utility room or otherwise so located in an apartment or locked room, but shall be in the utility room or otherwise so located as to be readily accessible to all occupants of the building at all times. All valves shall be clearly visible or of easy access.

All Main shut-off valves shall be approved lubricated plug-type, ball type, or of a type approved by the administrative authority.

SBC 8023 Gas Valves. For each burning device there shall be provided, in the pipe supplying same, and adjacent thereto, an independent shut-off valve, placed in an accessible location.

Every valve shall be readily accessible for operation and repair. All gas valves shall be of lever handle type. Inputs exceeding 1,000,000 BTU per hour, or where metering or regulating pressure exceeds 14 inches water column, the valve shall be an approved lubricated plug type, ball type, or of a type approved by the administrative authority.

(1) Accessibility of Gas Valves. Main shut-off valves controlling several gas piping systems shall be placed an adequate distance from each other so they will be easily accessible for operation and shall be installed so as to be protected from physical damage. It is recommended that they be plainly marked with a metal tag attached by the installing agency so that the gas piping systems supplied through them can be readily identified. It is advisable to place a shut-off valve at every point where safety, convenience of operation, and maintenance demands.

(2) Shut-off Valves for Multiple House Lines.

(a) In multiple tenant buildings supplied through a master meter or one service regulator when a meter is not provided, or where meters or service regulators are not readily accessible from the appliance location, an individual shut-off valve for each apartment, or for each separate house line, shall be provided at a convenient point of general accessibility.

(b) In a common system serving a number of individual buildings, shut-off valves shall be installed at each building.

SBC 8024 Electrical Grounding

(a) A gas piping system within a building shall not be used as a grounding electrode.

(b) Underground gas service piping shall not be used as a grounding electrode.

(c) Gas piping shall be grounded to an NEC approved ground. See Z 21:30.

SBC 8025 Gas Pressure Regulators

(1) General. All relief devices or regulators equipped with relief devices shall be vented to the outside atmosphere.

When the gas supply pressure is higher than the pressure at which the burner or appliance is designed to operate, a gas pressure regulator shall be installed.

(2) High Pressure Gas Regulators. Gas regulators designed to regulate from pounds inlet pressure to pounds outlet pressure shall:

(a) Have a pressure rating of not less than the protected metering pressure.

(b) Be of the full lock up type.

(c) All such regulators shall be vented to the outside of the building.

(3) High Pressure to Low Pressure Regulators. Gas regulators designed to regulate pounds inlet pressure to low outlet pressure shall:

(a) Have a pressure rating of not less than the protected metering pressure.

(b) Be of the full lock up type.

(c) All such regulators shall be vented to the outside of the building, except that regulators equipped with vent limiting devices, to limit the escape of gas from the vent opening in the event of diaphragm failure, may be used without outside vents when approved by the administrative authority.

(4) Low Pressure Regulators. Gas regulators designed to regulate from low inlet pressure to lower outlet pressure shall:

(a) Low pressure regulators are not required to be vented to the outside of the building unless the connected load exceeds 1,000,000 BTU per hour.

(b) Low pressure regulator vents shall be protected from stoppage by dirt and foreign matter.

(c) Low pressure regulator vents shall not be vented into a combustion chamber that is equipped with an intermittent pilot.

(5) Regulator Installation. All regulator installations shall comply with the following:

(a) Regulators shall be installed in accordance with the manufacturer's instructions.

(b) Regulators shall be rated to supply the total load required.

(c) Regulators shall be readily accessible for servicing in no case shall said regulators be covered by ceiling or other types of unventilated construction.

(d) All regulators shall be provided with an accessible shut-off valve for servicing the regulator.

(e) High gas pressure protection shall be provided when using a high pressure regulator or a high pressure to low pressure regulator unless otherwise approved by the administrative authority. The protection device may be incorporated as part of the regulator or by separate pressure limiting mechanism.

(f) When regulators are required to be vented to the outside of the building, such vent piping shall be sized in accordance with the manufacturer's instructions. Vent piping shall terminate a minimum of six feet away from combustion or any air inlet to the building and shall be suitably screened and hooded so as to prevent accidental closure of the vent pipe.

(g) Regulators shall be vented individually unless otherwise approved by the administrative authority.

(h) Regular vents shall not terminate into a vent connector, breeching, stack, or chimney.

SBC 8026 Size of Piping to Gas Appliances

(1) Gas piping shall be of such size and so installed as to provide a supply of gas sufficient to meet the maximum demand without undue loss of pressure between the meter, or service regulator when a meter is not provided, and the appliance or appliances. The size of the gas piping depends upon the following factors:

(a) Allowable loss in pressure from meter, or service regulator when a meter is not provided, to appliances.

(b) Maximum gas consumption to be provided.

(c) Length of piping and number of fittings.

(d) Specific gravity of the gas.

(e) Diversity factor.

(f) Manufacturers minimum pressure requirement at the appliance.

SBC 8027 Gas Consumption

(1) The quantity of gas to be provided at each outlet shall be determined, whenever possible, directly from the manufacturer's BTU rating of the appliance which will be installed. In case the ratings of the appliances to be installed are not known, Table 1, is given to show the approximate consumption of average appliances of certain types in BTU per hour.

(2) To obtain the cubic feet per hour of gas required, divide the total BTU input of all appliances by the average BTU heating value per cubic foot of gas (1,000 BTU per hour.) for natural gas.

APPROXIMATE GAS INPUT FOR SOME COMMON APPLIANCES

APPLIANCE	Input BTU per hour Approximate
Water heater, automatic storage, 30-40 gal. tank	45,000
Water heater, automatic storage, 50 gal. tank	55,000
Water heater, automatic instantaneous (2 gal. per min.)	142,800
Water heater, automatic capacity (4 gal. per min.)	285,000
Water heater, automatic capacity (6 gal. per min.)	428,400
Water heater, domestic, circulating or side arm	35,000
Refrigerator	3,000
Clothes dryer, Type 1 (domestic)	35,000
Gas light	2,500
Incinerator, Domestic	35,000

For specific appliances or appliance not shown above, the input should be determined from the manufacturer's rating.

DOMESTIC RANGE TABLE

The following table shall be used in sizing gas piping for the domestic ranges and built-in cooking units:

Number Ranges	Demand Cubic Feet	Number Ranges	Demand Cubic Feet
1	60	15	275
2	90	16	285
3	110	17	295
4	130	18	315
5	145	20	330
6	160	22	356
7	175	24	375
8	190	26	390
9	200	28	420
10	210	30	430
11	225	40	500
12	235	60	690
13	250	80	820
14	260	100	900

SBC 8028 Size of Pipe. The size of the gas pipe hereafter installed shall conform to one of the following tables. The correct table should be selected as determined by the allowable pressure drop from SBC 8025 and SBC 8026. The gas capacities for various pipe sizes are given for a specific pressure drop. Due allowances for the effect of any ordinary number of fittings shall be made.

Following the sizing tables, Figure No. 1 can be used to determine the size of each branch and section of gas piping system based on Table No. 2.

TABLE NO. 1

Maximum capacity of pipe in cubic feet of gas per hour based upon a pressure drop of 0.3 inch water column and 0.6 specific gravity gas.

Length in Feet	NOMINAL IRON PIPE SIZE, INCHES								
	½	¾	1	1¼	1½	2	2½	3	4
10	132	278	520	1050	1600	3050	4800	8500	17500
20	92	190	350	730	1100	2100	3300	5900	12000
30	73	152	285	590	890	1650	2700	4700	9700
40	63	130	245	500	760	1450	2300	4100	8300
50	56	115	215	440	670	1270	2000	3600	7400
60	50	105	195	400	610	1150	1850	3250	6800
70	46	96	180	370	560	1050	1700	3000	6200
80	43	90	170	350	530	990	1600	2800	5800
90	40	84	160	320	490	930	1500	2600	5400
100	38	79	150	305	460	870	1400	2500	5100
125	34	72	130	275	410	780	1250	2200	4500
150	31	64	120	250	380	710	1130	2000	4100
175	28	59	110	225	350	650	1050	1850	3800
200	26	55	100	210	320	610	980	1700	3500

TABLE NO. 2

Maximum capacity of pipe in cubic feet of gas per hour based upon a pressure drop of 1 inch water column and .60 specific gravity gas.

Length in Feet	NOMINAL PIPE OR I. D. TUBING SIZE									
	⅜	½	¾	1	1¼	1½	2	2½	3	4
5	145	280	750	1080	2200	3450	7000	11200	20000	42000
10	96	187	500	760	1550	2450	4950	8000	14200	29500
15	76	148	395	620	1300	2000	4000	6500	11500	24000
20	66	126	335	520	1100	1700	3450	5600	10000	21000
30	52	100	265	440	900	1400	2850	4600	8300	17000
40	44	84	225	380	795	1200	2500	4000	7200	14500
50	39	74	200	345	700	1100	2200	3550	6350	13000
60	35	67	180	315	640	1000	2000	3250	5800	12000
70	32	61	165	290	600	920	1850	3000	5400	11000
80	30	57	153	270	560	860	1750	2800	5050	10400
90	28	53	142	255	520	810	1650	2650	4750	9700
100	26	50	134	240	500	770	1580	2500	4500	9300
125	23	44	118	215	450	690	1400	2250	4000	8400
150	21	39	106	195	410	620	1290	2050	3650	7600
175	19	36	97	180	380	580	1190	1900	3400	7000
200	18	34	90	170	355	540	1100	1780	3200	6600
250	16	30	79	150	315	490	980	1600	2850	5900
300	14	26	71	140	285	445	900	1460	2600	5400

TABLE NO. 3

Maximum capacity of pipe in cubic feet of gas per hour, based upon a pressure drop of 7 inches water column and .60 specific gravity gas.

Length in Ft.	NOMINAL PIPE OR I. D. TUBING SIZE										
	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
5	190	440	850	2300	2900	6000	9200	19000	30000	54000	110M
10	128	295	570	1540	2000	4200	6500	13000	26000	38000	80000
15	100	235	450	1200	1650	3400	5300	10800	17500	31000	64000
20	85	200	380	1030	1400	2900	4600	9300	15000	27000	55000
30	67	100	300	820	1150	2400	3700	7000	12000	22000	45000
40	57	125	255	700	1000	2100	3200	6500	10500	19000	39000
50	50	117	225	610	900	1850	2850	5800	9400	17000	35000
60	46	108	205	550	820	1700	2600	5400	8600	15500	31000
70	41	96	185	500	760	1600	2450	5000	8000	14000	20500
80	38	90	173	470	710	1500	2250	4700	7500	13000	27500
90	30	84	162	440	660	1400	2150	4400	7000	12500	26000
100	34	79	152	410	625	1300	2000	4150	6700	12000	25000
125	30	69	135	360	570	1150	1800	3700	6000	10500	22000
150	27	63	122	325	520	1080	1650	3400	5400	9800	20000
175	25	58	112	300	480	1000	1550	3100	5000	9000	18500
200	23	53	102	280	450	940	1450	2900	4750	8400	17000
250	20	47	90	240	400	850	1300	2600	4300	7500	15500
300	18	42	81	220	370	760	1150	2400	3900	7000	14000

SBC 8128

TABLE NO. 4

Maximum capacity of pipe in cubic feet of gas per hour, based upon a pressure drop of 1½ pounds per square inch and .60 specific gravity gas.

Length in Ft.	NOMINAL PIPE OR I. D. TUBING SIZE										
	¼	⅜	½	¾	1	1¼	1½	2	2½	3	4
5	540	1260	2400	6500	10500	21000	31000	58000	90000	150M	310M
10	360	850	1630	4350	7600	15000	22000	41000	64000	110M	220M
15	285	670	1280	3450	6200	12000	18000	34000	52000	90000	180M
20	240	570	1080	2950	5400	10500	15000	29000	45000	790M	150M
30	192	450	860	2300	4400	8600	13000	24000	36000	630M	125M
40	163	380	730	2000	3800	7500	11000	20000	32000	55810	110M
50	143	335	645	1750	3350	6700	9800	18000	28000	49000	97000
60	130	300	580	1560	3050	6100	9000	17000	26000	45900	90000
70	118	275	530	1430	2800	5600	8200	15000	24000	41000	82000
80	110	255	490	1330	2650	5200	7700	14000	22000	38000	77000
90	102	240	460	1230	2500	4900	7200	13500	21000	36500	72000
100	96	225	430	1160	2350	4700	6800	12500	20000	34500	70000
125	85	198	380	1025	2100	4150	6100	11300	18000	31000	62000
150	76	178	340	920	1900	3800	5600	10400	16000	28400	56000
175	69	164	315	845	1800	3550	5200	9700	15500	20000	53000
200	64	146	290	780	1700	3300	4900	9000	14000	24000	49000
250	58	140	255	690	1500	2950	4300	8100	12500	22600	44000
300	51	120	230	620	1350	2700	4000	7400	11500	19000	40000

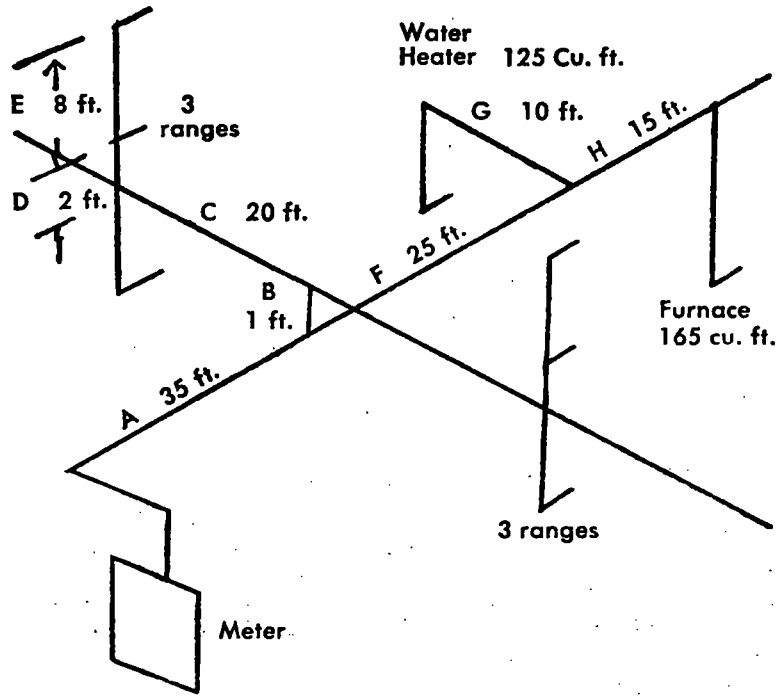
TABLE NO. 5

Multipliers to be used with tables when the specific gravity of the gas is other than used in Table.

Specific Gravity	Multiplier	Specific Gravity	Multiplier
.35	1.31	1.00	.775
.40	1.23	1.10	.740
.45	1.16	1.20	.707
.50	1.10	1.30	.680
.55	1.04	1.40	.655
.60	1.00	1.50	.633
.65	.962	1.60	.612
.70	.926	1.70	.594
.75	.895	1.80	.577
.80	.867	1.90	.565
.85	.841	2.00	.847
.90	.817	2.10	.535

Figure No. 1

Example to calculate a gas piping system based on pressure drop used in Table 2.



The following is an example of sizing gas piping using Table 1 in SBC 1927.

1. Use gas range Table 4 for multiple range installation when sizing all main and branch line piping. Use actual input rating on water heater and furnace.

2. To size pipe A put the total input load on the distance from meter to end of longest run.

6 ranges + water heater + furnace
160+125+165=450 cu. ft.
35+25+15=75 ft. developed length

Chart 450 cu. ft. and 75 ft. length
1¼ inch pipe for Section A.

3. To size Pipe B, put 6 ranges on distance from meter to end range.

6 ranges=160 cubic feet: 35+1+20+2+8=66 ft. length.
¾ inch pipe for Section B.

4. To size pipe C put 3 ranges on distance from meter to end range.

3 ranges=110 cu. ft.: 35+1+20+2+8=66 ft. length.
¾ inch pipe for Section C.

5. To size pipe D put 2 ranges on distance from meter to end range.

2 ranges=90 cu. ft.: 35+1+20+2+8=66 ft. length
¾ inch pipe for Section D.

6. To size pipe E put 1 range on distance from meter to the range.

1 range=60 cu. ft.: 35+1+20+2+8=66 ft. length
½ inch pipe for Section E.

7. To size pipe F put water heater and furnace on the longest distance from meter.

Water heater 125 cubic feet + Furnace 165 cubic feet=290 cubic feet.
35+25+15=75 feet length
1¼ in pipe for Section F.

8. To size pipe G put water heater on the distance from the meter.

Water heater 125 cu. ft.: 35+25+10=70 feet
1 inch pipe for Section G.

9. To size pipe H put furnace on the distance from meter.

Furnace 165 cu. ft.: 35+25+15=75 feet length
1 inch pipe for Section H.

SBC 8029 Test of Piping. Upon completion of any gas piping system and before any of the piping has been covered, concealed, or painted, the person making the installation shall notify the administrative authority that the work is ready for inspection and test. All tests shall be made in the presence of the authority. The following pressures shall be the tests required. The authority may determine the length of time such tests shall stand without showing a drop in pressure. For the purpose of this code, gas pressures not exceeding 14 inches water column shall be called the low pressure. Gas pressures exceeding 14 inches water column shall be called high pressure.

Low pressure piping shall be air tested at a pressure of at least 10 pounds per square inch.

High pressure piping shall be air tested at a pressure 50% greater than the maximum operating pressure, but not less than 25 pounds per square inch.

The air gauge and pump to make the test shall be furnished by the person making the installation.

However, in the cases of minor alterations or extensions the authority may not require such tests, if in his judgment such tests are not necessary.

SBC 8030 Leakage Test After Gas Turn On

(1) Close All Gas Outlets. Before turning gas under pressure into any piping, all openings from which gas can escape will be closed.

(2) Check for Leakage. Immediately after turning on the gas, the piping system shall be checked by one of the following methods to ascertain that no gas is escaping:

(a) Checking the Leakage Using the Gas Meter. Immediately prior to the test it should be determined that the meter is in operating condition and has not been bypassed.

Checking for leakage can be done by carefully watching the test dial of the meter to determine whether gas is passing through the meter. To assist in observing any movement of the test hand, wet a small piece of paper and paste its edge directly over the center line of the hand as soon as the gas is turned on. Allow five minutes for a one-half foot dial and proportionately longer for a larger dial in checking for gas flow. This observation should be made with the test hand on the upstroke.

In case careful observation of the test hand for a sufficient length of time reveals no movement, the piping shall be purged and a small gas burner turned on and lighted and the hand of the test dial again observed. If the dial hand moves (as it should) it will show that the meter is operating properly. If the test hand does not move or register flow of gas through the meter to the small burner, the meter is defective and the gas should be shut off and the serving gas supplier notified.

(b) Checking for Leakage Not Using a Meter. This can be done by attaching to an appliance orifice a manometer or equivalent device calibrated so that it can be read in increments of 0.1 inch water column, and momentarily turning on the gas supply and observing the gaging device for pressure drop with the gas supply shut off. No discernible drop in pressure shall occur during a period of 3 minutes.

(c) When Leakage is Indicated. If the meter test hand moves, or a pressure drop in the gage is noted, all appliances or outlets supplied through the system shall be examined to see if they are shut off and do not leak. If they are found tight there is a leak in the piping system. The gas supply shall be shut off until the necessary repairs have been made, after which the test specified is (a) and (b) shall be repeated.

SBC 8031 Purging

(1) Purging All Gas Piping.

(a) After piping has been checked, all gas piping shall be fully purged. A suggested method for purging the gas piping to an appliance is to disconnect the pilot piping at the outlet of the pilot valve. Piping shall not be purged into the combustion chamber of an appliance.

(b) The open end of piping systems being purged shall not discharge into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control of purging rate, and elimination of all hazardous conditions.

(2) Light Pilots. After the gas piping has been sufficiently purged, all appliances shall be purged and the pilots lighted. The installing agency shall assure itself that all piping and appliances are fully purged before leaving the premises.

SBC 8032 LP Gas Installations. The installation and maintenance of undiluted or diluted LP gas installations or portions of such installations shall be made to the standards of USA Standard Storage and Handling of Liquefied Petroleum Gases Z-106.1 (NFPA No. 58) and applicable sections of this code.

SBC 8033 General Safety Precautions

(1) Checking for Gas Leaks. When an investigation discloses a concentration of gas inside of a building, the following immediate actions shall be taken, simultaneously if possible.

(a) Clear the room, building, or area of all occupants.

(b) Shut off the supply of gas to the areas involved.

(c) Ventilate the affected portion of the building by opening windows and doors including basement windows.

(d) Use every practical means to eliminate sources of ignition. Take precautions to prevent smoking, striking matches, operating electrical switches, or devices, opening furnace doors, etc. If possible, cut off all electric circuits at a remote source to eliminate operation of automatic switches in the dangerous area. Safety flashlights designed for use in hazardous atmospheres are recommended for use in such emergencies.

(e) Investigate other buildings in the immediate area to determine the presence of escaping gas therein.

(f) Notify the gas supplier.

OIL BURNERS. This chapter will be sub-divided into the following subjects:

SBC 8101 DEFINITIONS

SBC 8102 APPROVALS

SBC 8103 FUEL OIL

SBC 8104 TANKS

SBC 8105 PIPING CONTROLS PUMPS AND VALVES

SBC 8106 INSTALLATION OF OIL BURNERS AND OIL BURNER EQUIPMENT

SBC 8107 KEROSENE OIL STOVES AND PORTABLE HEATERS

SBC 8108 INSPECTION AND TESTS

SBC 8101 Definitions. The following terms shall mean:

OIL BURNER. A device for burning oil in heating appliances such as boilers and furnaces or process equipment.

(1) A burner of this type may be furnished with or without a primary control.

(2) It may be a pressure atomizing gun type, a horizontal or vertical rotary type, or a mechanical or natural draft vaporizing type, air or steam atomizing type.

OIL BURNING EQUIPMENT. An oil burner of any type together with its tank, piping, wiring, controls, and related devices and shall include all oil burners, and oil-fired units.

OIL-FIRED UNIT. A heating appliance equipped with one or more oil burners and all the necessary safety controls, electrical equipment, and related equipment manufactured for assembly as a complete unit.

SBC 8102 Approvals. Approval of Oil Burner Required.

(1) No person shall install any domestic or commercial oil burner that does not carry the label of the Underwriter's Laboratories or any other nationally recognized testing laboratory.

(2) The administrative authority shall approve any oil burner listed by, or carrying the label of the Underwriter's Laboratory or any other nationally recognized testing laboratory, providing such oil burner also meets the approval requirements of the applicable chapter sections of this code.

Installation of Used Oil Burners. No person shall install a used burner for use in connection with a heating system unless he has furnished the administrative authority with a statement that said burner has been checked and found to be equivalent to new equipment in operation and safety, together with a letter from the purchaser acknowledging that said purchaser is buying a used oil burner. Such burner shall comply with all applicable sections of this code.

SBC 8103 Fuel Oil. Grade. The grade of fuel oil used in a burner shall be that for which the burner is approved and as stipulated by the manufacturer. Crankcase oil or any oil containing gasoline shall not be used.

NOTE: The label of Underwriter's Laboratories, Inc. and Underwriters' Laboratories of Canada stipulates for each burner the grade of fuel oil for which the burner is listed.

Heavy Oils. Where heavy oils are used, provision shall be made for maintaining the oil at the proper atomizing temperature. Automatically operated burners requiring the pre-heating of oil shall be arranged so that no oil can be delivered for combustion until the oil is at a suitable atomizing temperature.

Steam Coils in Oil Tanks. No steam coil operating at a pressure greater than 15 pounds per square inch gage shall be installed in an oil tank. When a pressure reducing valve is used to limit the steam pressure to 15 psi or less, a relief valve set at not more than 5 psi above the normal pressure in the coil shall be provided.

Flash Point.

(1) The oil shall have a flash point not less than 100° degrees F. and shall be free from acid, grit, and fibrous or other foreign matter likely to clog or injure the burner or valves.

SBC 8104 Tanks. Design, Construction and Installation of Fuel Oil Tanks.

The design, construction and installation of fuel oil tanks, both underground and inside buildings shall be in compliance with Chapter 2, Section 20 to 26 of the State Fire Marshal's Flammable Liquids Code.

SBC 8105 Piping, Controls, Pump and Valves. Piping.

(1) All piping shall be standard full weight wrought iron, steel, or brass pipe with standard fittings or approved brass or copper tubing with approved fittings except that approved flexible metal hose may be used for reducing the effects of jarring and vibration or where rigid connections are impracticable.

(2) Pipe used in the installation of domestic type burners shall not be smaller than ⅜ inch iron pipe size; pipe used in the installation of industrial type burners shall not be smaller than ½ inch iron pipe size. Copper or brass tubing used in the installation of domestic type burners where the oil flows by gravity from the tank to the burners shall not be smaller in size than ⅜ inch outside diameter, .049 inch wall thickness tubing. For industrial type burners such copper or brass tubing shall not be smaller in size than the equivalent of the iron pipe size mentioned above, with wall thickness not less than .049 inch.

(3) Flexible metal hose shall be installed strictly in accordance with the limitations of its approval.

(4) Piping shall be rigidly secured in place and protected from injury in a workmanlike manner, and where necessary, shall be protected against corrosion.

(5) Pipe joints and connections shall be made tight in a workmanlike manner. Unions and tubing fittings shall be of approved type.

(6) Proper allowance shall be made for expansion, contraction, jarring, and vibration. Pipe lines, other than tubing, connected to underground tanks, except fill lines and test wells, shall be provided with double swing joints arranged to permit the tank to settle without impairing the efficiency of the pipe connections.

(7) Oil supply lines to burners shall be provided with approved strainers.

Tank Vents.

(1) Storage tanks shall be equipped with an open vent or an approved automatically operated vent, arranged to discharge to the open air. Vent openings and vent pipes shall be of ample size to prevent abnormal pressure in the tank during filling but not smaller than 1¼ in pipe size.

(2) Vent pipes shall be arranged to drain to the tank. The lower end of the vent pipe shall not extend through the top into the tank for a distance of more than one inch.

(3) Vent pipes shall terminate outside of buildings at a point not less than 2 feet, distant from any window or other building opening and not less than one foot above fill cap nor less than 2 feet above the ground. Outer ends of vent pipes shall be provided with a weatherproof hood to such a height that oil vapors discharging from the vent will be readily diffused without danger of ignition. However, combination fill and vent fittings approved by the administrative authority may be used if located not less than 2 feet distant from any window or other building opening and not less than 2 feet above the ground.

(4) Vent pipes shall not be cross-connected with fill pipes or return lines from burners.

(5) Fill and vent pipes shall not be run through windows or coal-chutes unless such openings are totally enclosed with masonry to prevent oil from entering buildings during filling operations.

(6) The vent size shall be as shown in Table 1.

TABLE No. 1

Capacity of Tank U.S. Gallons	Approx. Imperial Gallons	Diameter of Vent, Iron Pipe Size
500 or less	500 or less	1¼ inches
501 to 3,000	501 to 2,500	1½ inches
3,001 to 10,000	2,501 to 8,300	2 inches
10,001 to 20,000	8,301 to 16,600	2½ inches
20,001 to 35,000	16,601 to 29,000	3 inches

NOTE: Where tanks are filled by the use of a pump through tight connections, special consideration should be given to the size of the vent pipe to insure that it is adequate to prevent the development of abnormal pressure in the tank during filling. This may be accomplished by providing a vent pipe not less in size than the discharge of the pump.

Tank Fill and Overflow Pipes.

(1) Underground tanks and storage tanks inside buildings shall be filled only through fill pipes terminating outside of buildings at a point at least 2

feet from any building opening at the same or lower level. Fill terminals shall be closed tight, when not in use, by a metal cover designed to prevent tampering.

(2) Auxiliary tanks other than vacuum tanks shall be equipped with an over-flow pipe.

(3) Overflow pipes of auxiliary gravity tanks shall have no valves or obstructions. Overflow pipes of auxiliary pressure tanks shall be provided with inter-connected valves or other means for automatically venting the tank during filling.

Oil Gauging.

(1) All tanks in which a constant oil level is not maintained by an automatic pump shall be equipped with an approved method of determining the oil level.

(2) Test wells shall not be installed inside buildings and where permitted for outside services shall be closed tight when not in use by a metal cover designed to prevent tampering.

(3) Gauging devices such as liquid level indicators or signals shall be installed so that oil or vapor will not be discharged into the fuel supply system.

(4) No glass gauge, or any gauge the breaking of which will permit oil to escape from the tank, shall be used.

Oil Pumps.

(1) Oil pumps shall be of approved type, secure against leaks, and shall be rigidly fastened in place.

(2) Automatic pumps not an integral part of the burner shall be arranged to stop automatically in case of total breakage of the supply line to the burner if such line is pressurized.

(3) In isolated locations, where fire protection equipment is dependent upon a heating plant fired by an oil burner, oil pumps supplying the burner shall be installed in duplicate.

Valves.

(1) Readily accessible shut-off valves of approved type shall be installed in oil supply lines near each burner and close to gravity and pressure supply tanks. Shut-off or check valves of approved type shall be installed on each side of oil strainers which are not a part of the oil burner unit and on the discharge and suction side of oil pumps which pump directly to the burner but which are not a part of the burner unit.

(2) Where a shut-off valve is installed in the discharge line of an oil pump, an approved pressure relief valve shall be connected into the discharge lines between the pump and the shut-off valve and arranged to return surplus oil to the storage tank or to by-pass it around the pump.

(3) Control valves shall be of the approved type. Valves shall be designed to close against the supply and to prevent withdrawal of stem by continued operation of the handwheel. Packing affected by the oil or by heat shall not be used.

Gravity Feed to Burners.

(1) Gravity feed shall be used only with burners arranged to prevent abnormal discharge of oil at the burner by automatic means specifically approved for the burner with which it is used.

(2) A domestic supply tank shall not have a capacity of more than 550 gallons or two tanks of aggregate capacity of 550 gallons.

(3) On multiple domestic tank installations, the fill pipe shall be so arranged that both tanks will fill equally and the vent pipe shall extend well above cross connections between tanks to prevent air binding when filling.

(4) Where oil is supplied to the burner by gravity and a constant level device is not incorporated in the burner assembly or in an auxiliary tank used in connection with an automatic pump, an approved constant level device shall be installed in the oil feed line at the gravity tank or as close thereto as practicable. The vent opening of such constant level device shall be connected by piping or tubing to outside the building unless the constant level device is provided with an approved anti-flooding device. Vent pipes or tubing of constant level devices shall not be connected to tanks or tank vents.

Pressure Feed.

(1) Pressure tank feed shall be used only with burners arranged to prevent abnormal discharge of oil at the burner by automatic means specifically approved for the burner with which it is used.

Preheating Oil. Preheating of oil, where necessary, shall be done by steam, hot water or approved electric heaters. Heaters shall be substantially constructed with all joints made oil tight. Thermometers shall be installed at suitable locations to indicate the temperature of the heated oil. Heaters shall be by-passed or provided with suitable means to prevent abnormal pressure.

Locking Fill Pipe. Whenever an oil burner is removed to be replaced with another fuel the "fill and vent" piping should be removed from the supply tank and those remaining openings of the supply tank be closed with "pipe-plugs" or complete removal of such supply tank.

(1) Oil burner installations with burner inputs of less than 5 gallons of oil per hour shall have the following controls:

(a) A draft regulator.

(b) A stack relay or similar device providing positive shut-off for flame failure or failure to obtain ignition within 90 seconds after start of burner.

(c) A high temperature limit control.

(2) Oil burners having inputs of over 500,000 BTU per hour shall be in accordance with Underwriters' Laboratories, Inc. and NFPA No. 31.

(3) Oil burners other than oil stoves with integral tanks, shall be provided with some means for manually stopping the flow of oil to the burner. Such device or devices shall be placed in a convenient location at a safe distance from the burner.

(4) Each appliance fired by oil burners and each oil-fired unit shall be provided with automatic limit controls which will prevent unsafe pressure or low water in a steam boiler or over-heating within a hot-water boiler, furnace, or heater.

(5) Limiting controls and low-water shutoffs intended to prevent unsafe operation of heating equipment by opening an electrical circuit to the burner or oil shutoff device shall be so arranged as to effect the direct opening of that circuit, whether the switching mechanism is integral with the sensing element or remote from same.

(6) In systems where either steam or air is used for atomizing the oil or where air for combustion is supplied by a source which may be interrupted without shutting off the oil supply, the oil and atomizing or air supply shall be interlocked in a manner to immediately shut off the oil supply upon failure of the atomizing or air supply.

(7) When automatically-operated burners are used in installations equipped with forced or induced draft fans or both, means shall be provided to immediately shut off the oil supply upon fan failure.

SBC 8106 Installation of Oil Burners and Oil Burner Equipment

(1) Oil-fired appliances shall be installed in rooms that are large compared with the size of the appliance except that an appliance specifically approved for installation in a confined space such as an alcove or closet may be so installed when the installation is in compliance with the approval. In alcove and closet installations, the clearances from the appliance to the walls and ceiling shall be not less than as specified in the approval regardless of the type of construction.

(2) Oil burning appliances shall be installed so as to be reasonably safe to persons and property. Evidence that oil burning appliances have been installed in accordance with the applicable standard specified in this section shall be evidence that such oil burning appliances are reasonably safe to persons and property.

(3) Oil burners shall be securely installed in a workmanlike manner, in accordance with the instructions of the manufacturer, by qualified mechanics experienced in making such installations.

(4) Where oil burners are installed in furnaces originally designed for solid fuel, the ash door of the furnace shall be removed or bottom ventilation otherwise provided to prevent the accumulation of vapors in the ash pit, unless the burner is of a type which mechanically purges the ash pit.

(5) Boilers and furnaces in which oil burners are installed shall be connected to flues having sufficient draft at all times to assure safe operation of the burner; a suitable draft regulating device shall be installed where necessary to prevent excessive draft. Manually operated dampers shall be such that they cannot close off more than 80% of the internal cross-section area of the smoke pipe. Automatically operated dampers shall be of approved type designed to maintain a safe damper opening at all times and arranged to prevent starting of the burner unless the damper is opened at least 20% of the internal cross-section area of the smoke pipe.

(6) Complete instructions for the care and operations of the oil burner equipment shall be conspicuously posted near the oil burner and shall be maintained in readable condition by user, and there shall be displayed, near the heating plant, a card which shall read as follows:

NOTE: This code requires that pipe dampers shall be removed or locked in the desired position and no damper closing off more than 80 percent of the pipe area shall be allowed. All check drafts must be kept closed at all times.

(7) Contractors installing industrial oil burner systems shall furnish diagrams showing the main oil lines and controlling valves, one of which shall be posted near the oil burner equipment and another at some point which will be accessible in case of fire at the burners.

Accessibility, Clearance, and Permissible Temperatures.

(1) Accessibility for Service. Every oil-fired appliance shall be located with respect to building construction and other equipment so as to permit access to the appliance. Sufficient clearance shall be maintained to permit cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls, and vent connections; the lubrication of moving parts where required; and the adjustment and cleaning of burners.

(2) Clearance and Permissible Temperatures. Every oil-fired appliance and its vent connector shall be installed with clearances to combustible materials as specified by the manufacturer of the equipment so that continued or intermittent operation will not create a hazard to person or property. They shall not, during operation, raise the temperature of unprotected combustible walls, partitions, floors or ceilings more than 90 degrees F. above normal room temperature when measured with mercury thermometers or conventional bead type thermocouples.

Combustion Air Requirements. The air required for combustion shall be in accordance with Chapter 77 of this code.

Electric Wiring. Electric wiring and equipment in connection with oil burning equipment shall be in accordance with the provisions of the State of Minnesota Electrical Code.

Modifications. Where the circumstances or conditions of any particular installation are unusual and such as to render the strict application of the provisions of this chapter impracticable, the administrative authority may permit such modifications as will provide a substantially equivalent degree of safety.

SBC 8107 Kerosene and Oil Stoves and Portable Kerosene Heaters. General Precautions.

(1) The safety of installation and use of appliances of this kind depend largely upon the care of the installer and the care of the user in following the manufacturer's operating and installation instructions.

(2) Appliances of this class shall be kept clean and in good repair. If parts become worn or damaged they shall be replaced promptly, preferably by the manufacturer or his representative. Where replacements or repairs must be made by the user, such attention shall be strictly confined to procedures which have been fully covered by the manufacturer's printed instructions.

(3) Instructions furnished by the manufacturer shall be preserved.

(4) Special care must be employed in the placing of kerosene stoves and portable kerosene heaters in order to avoid contact with combustible material including draperies and to avoid accidental overturning. Placing fabrics on stoves for drying is dangerous.

(5) Appliances shall be installed on noncombustible flooring unless listed for installation on combustible flooring.

(6) A range shall be equipped with a drip pan beneath the burners and with integral base or legs to locate the cooking surface at a proper height for ordinary use.

(7) Portable kerosene heaters shall be equipped with a sheet metal tray underneath the burner as an integral part of the heater.

(8) Stoves shall be placed so that curtains or draperies may not be blown over or into contact with heater surfaces or open flame.

(9) Appliances shall be carefully leveled in accordance with manufacturer's installation instructions.

(10) When manufacturer's instructions specify that stoves are to be fastened to the floor these instructions shall be carefully followed, but in all cases stoves supplied with fuel from separate supply tanks shall be securely attached to the floor or otherwise secured in position to avoid strains on piping.

Controls.

(1) Kerosene and oil stoves and portable kerosene heaters shall be equipped with a primary safety control furnished as an integral part of the appliance by the manufacturer to stop the flow of oil in the event of flame failure. Barometric oil feed shall not be considered a primary safety control.

NOTE: Stoves and heaters listed by Underwriters' Laboratories, Inc. and Underwriters' Laboratories of Canada are so equipped.

Flue Connections.

(1) Appliances that are provided with a flue outlet shall be connected to a suitable flue having sufficient draft at all times to assure safe operation of the appliance.

Supply Tanks.

(1) Stoves designed for barometric oil feed shall not be connected to separate supply tanks.

(2) Stoves which are not designed for flue conection shall be equipped with integral tanks having capacity of not more than two gallons.

(3) An oil stove specifically designed and listed for use with separate supply tanks may be directly connected for gravity feed from a supply tank or an automatic pump.

(4) The filling of barometric tanks and kerosene stove tanks and reservoirs of portable kerosene heaters shall be done outside buildings or at a special location where precautions can be taken to minimize the spilling of oil.

(5) A barometric tank shall not be placed in position in the stove sump until the oil has reached room temperature.

Clearances and Mounting.

(1) Stoves shall be installed to provide clearances to combustible material not less than as shown in Table 7.

(2) Stoves which are listed for installation with lesser clearances than specified in Table 1 may be installed in accordance with their listing.

TABLE No. 1

Heating Appliances	Minimum Clearance, Inches		
	Sides	Rear	Chimney Connector
Room Heater, Circulating type	12	12	18
Room Heater, Radiant type	36	36	18

(3) Stoves may be installed with lesser clearances to combustible material provided the combustible material is protected. In no case shall the horizontal distance be less than six inches from a range to that portion of adjacent unprotected combustible walls or cabinets extending above the cooking top of the range.

(4) Stoves which have a fuel tank attached thereto, shall in all cases be installed with sufficient clearance to provide direct and easy access to the fuel tank.

(5) Stoves shall have a clearance vertically above the top of not less than 30 inches to combustible material or cabinets. When the underside of combustible material or cabinets is protected by asbestos millboard at least ¼ inch thick covered with sheet metal not lighter than 28 gauge, the distance shall be not less than 24 inches. The protection shall extend 9 inches beyond the sides of the stove.

(6) Listed stoves may be placed on combustible floors. Others shall be placed on the ground, on noncombustible floors, or on floors protected in accordance with accepted building code practice.

SBC 8108 Inspection and Tests. Tests of Covered Tanks and Piping. After installation and before being covered tanks of 1,000 gallons capacity or more, and piping shall be tested hydrostatically, or with equivalent air pressure, at a pressure not less than 1½ times the maximum working pressure but not less than 5 pounds per square inch at the highest point of the system. Instead of a pressure test, suction lines may be tested under a vacuum of not less than 20 inches of mercury. Such tests shall be made by the installer.

(1) Tanks and Piping. Immediately upon the installation of the tanks and piping of an oil burner installation, the installer thereof shall notify the administrative authority that said tanks and piping are ready for inspection and tests as required in this chapter. No person shall cover up any such tank or piping until the same shall have been inspected and approved.

(2) Oil Burner Inputs of Less than 500,000 BTU Per Hour. Upon completion of the test of any oil burner installation and placing the equipment in operation, the installer shall file with the administrative authority complete records of such test stating the date of test and name of person performing the test.

(3) Oil burners having inputs of over 500,000 BTU per hour shall be tested as required by the administrative authority. The tests required therein shall be witnessed by the authority prior to placing the burner in service. The installer shall file with the administrative authority a copy of the test report, signed by the installer or his authorized agent performing the test.

SBC 8201 STOKER AND COAL FIRED INSTALLATIONS. Standards Established. The arrangement, equipment, and manner of installation of all stokers installed for use in connection with heating plants and the alterations of all such stoker installations shall conform to the provisions of this chapter.

SBC 8202 Stoker Defined. The term "stoker" shall mean a mechanical device for feeding solid fuel into the combustion chamber of a boiler or furnace used in connection with a heating plant whether automatically or manually controlled.

SBC 8203 Approval of Stoker Required

(1) No person shall install any stoker that does not carry the approval label of a nationally recognized testing laboratory.

(2) The authority shall approve any stoker listed by or carrying the label of a nationally recognized laboratory providing such stoker also meets the approval requirements of the applicable chapter sections in this Code.

SBC 8204 General Installation Requirements. All systems and equipment shall be installed in accordance with the applicable sections of the Heating, Ventilating, Air Conditioning and Refrigeration Code.

SBC 8205 Calculating Heat Loss. All heat loss calculations shall be determined by the methods outlined in Chapter 73 of this Code.

SBC 8206 Non-Automatic Stokers Restricted. Stokers which are not equipped with automatic means of preventing excessive pressures or temperatures of the heating medium shall not be installed or operated in any location where a competent attendant will not be constantly on duty on the premises while the stoker is in operation.

SBC 8207 Automatic Controls

(1) Except as provided in SBC 8206, each mechanical stoker shall be equipped with at least one high limit control so connected as to shut off power from stoker drive in the event of excessive pressure in a steam boiler or excessive temperature in a hot water boiler or warm air furnace casing. Each steam boiler shall be equipped with a low water cut-off.

(2) Where there may be an over run of heat due to sustained periods of operation for the stoker, a reserve action control or equivalent control shall be installed in hot water systems so as to relieve this condition.

(3) On all installations where operation of burner is controlled by an aquastat, pressurestat, or furnacestat, a second control, either aquastat, pressurestat, or furnacestat, shall be installed in the 110 volt line ahead of all controls, as a high limit of safety control.

SBC 8208 Stoker Capacity, Setting Heights, Combustion Space

(1) The capacity of a stoker for any given installation shall be in accordance with the manufacturer's recommended load carrying capacities.

(2) The distance from retort to crown sheet and the space for combustion, within any boiler or furnace, shall be such as to secure efficient smokeless combustion. Where stokers are installed in old boilers and strict compliance with the foregoing requirements cannot be met, minor modifications may be made, subject to the approval of the Administrative Authority.

SBC 8209 Electric Wiring and Equipment. Electric wiring and equipment in connection with stoker installations shall be installed in accordance with Electrical Sections of the State Building Code.

SBC 8210 Combustion Air Requirements. Combustion air shall be sized and installed in accordance with Chapter 78 of this Code.

SBC 8301 ELECTRIC SPACE HEATING. Standards Established. The construction, arrangements and installation of equipment which directly converts electrical energy shall be governed by the provisions hereinafter set forth, when such equipment is used in connection with any system intended to heat any space, room or building for the comfort, health, or welfare of the occupants thereof.

SBC 8302 Equipment and Installation Requirements

1. Electrical heat generating and emission units and other electrical equipment, along with their installations and associated wiring, shall comply with provisions of Chapter 86 (ELECTRICAL) of the State Building Code. In addition, electric heat generating and emission units shall be listed by Underwriters Laboratories, Inc. or shall bear the label of the Underwriters Laboratories, Inc. or other nationally recognized testing laboratories. Lamps, heat lamps, infra-red lamps and tubes that do not carry a UL approval will be accepted.

2. All systems and appliances shall be installed in complete compliance with the manufacturers requirements and specifications.

SBC 8303 Heat Loss Calculations. Heat loss calculations shall be made in accordance with the provisions set forth in Chapter 73 of this Code.

SBC 8304 Electrical Energy Requirements for Space Heating

1. The total rating (or adjusted rating) of heat emission devices in each room or space to be heated shall equal or exceed the calculated heat loss of such room or space.

2. The total rating (or adjusted rating) of the heat emission devices shall equal or exceed the calculated aggregate heat loss of all rooms or spaces heated.

3. The output of each generating and emission unit shall be computed at the location where the electrical energy is converted to heat energy. The conversion of electrical energy to heat energy shall be considered at an efficiency of 100%. The heat output of a heat pump will be acceptable as rated by the equipment manufacturer.

SBC 8306 Other Requirements

1. Central heating systems of the warm air type shall have their rating as established in Chapter 75 WARM AIR HEATING of this Code.

2. Central heating systems of the steam or hot water type shall have their rating as established in Chapter 76 STEAM AND LIQUID SYSTEMS, of this Code.

3. An automatic temperature control system shall be provided for the heated space unless otherwise approved by the administrative authority.

SBC 8401 FIREPLACES AND INCINERATORS. Factory Built Fireplaces. Factory built fireplaces shall be listed and shall be installed in accordance with conditions of their listing. Hearth extensions shall be provided in accordance with SBC 8404.

SBC 8402 Factory Built Fireplace Stoves. Factory built fireplace stoves shall be listed and shall be installed in accordance with the conditions of the listing. Hearth extensions shall be provided in accordance with SBC 8404. (The requirement to be listed in SBC 8402 and SBC 8403 shall mean that the appliance has been tested and approved by the Underwriters' Laboratory or other Nationally recognized testing laboratory).

SBC 8403 Masonry Fireplaces. All masonry fireplaces shall be constructed and built in accordance with Chapter 84 of the State Building Code.

A. Warm air ducts employed with steel fireplace units of the circulating air type shall be constructed of metal or masonry.

B. Fireplace hearth extensions shall be provided of approved noncombustible material for all fireplaces. Where the fireplace opening is less than 6 square feet, the hearth extension shall extend at least 16 inches in front of, and at least 8 inches beyond each side of the fireplace opening. Where the fireplace opening is 6 square feet or larger the hearth extension shall extend at least 20 in. in front of, and at least 12 inches beyond each side of the fireplace opening. Where a fireplace is elevated above or overhangs a floor, the hearth extension shall also extend over the area under the fireplace.

C. Fireplaces constructed of masonry or reinforced concrete shall have hearth extensions of brick, concrete, stone, tile or other non-combustible approved material properly supported and with no combustible material against the underside thereof. Wooden forms or centers used during the construction of the hearth and hearth extensions shall be removed when the construction is completed.

D. Hearth extensions of approved factory built fireplaces and fireplace stoves shall be not less than ⅜ inch thick of asbestos, concrete, hollow metal, stone, tile or other aproved non-combustible material. Such hearth extensions may be placed on the sub or finish flooring whether the flooring is combustible or not. The hearth extension shall be readily distinguishable from the surrounding floor.

SBC 8404 Chimneys and Fireplaces. All chimneys used with fireplaces of either the factory built or masonry types shall have their chimneys in compliance with Chapter 74 of this Code and the applicable sections of the State Building Code.

SBC 8405 Incinerators. All incinerators shall meet the requirements and have approval of the Minnesota Pollution Control Agency not withstanding any provisions of this Code.

SBC 8406 Clearance

(a) Incinerators shall be installed in accordance with their listing and the manufacturer's instructions, provided that in any case the clearance shall be

sufficient to afford ready accessibility for firing, cleanout and necessary servicing.

(b) The clearance above a charging door to combustible material shall be not less than 48 inches. The clearance may be reduced to 24 inches provided that the combustible material is protected with sheet metal not less than No. 28 manufacturer's standard gage spaced out 1 inch on noncombustible spacers, or equivalent protection. Such protection shall extend 18 inches beyond all sides of the charging door opening. Listed incinerators designed to retain the flame during loading need not comply with this paragraph.

(c) Incinerators shall be installed with clearances to combustible material of not less than 36 inches at the sides and top and not less than 48 inches at the front, but in no case shall the clearance above a charging door be less than 48 inches. Unlisted wall mounted incinerators shall be installed on a noncombustible wall communicating directly with a chimney.

(d) Domestic type incinerators may be installed with reduced clearances to combustible material in rooms, provided the combustible material is protected as described. In confined spaces, such as alcoves, clearance shall be so reduced.

(e) When a domestic type incinerator that is refractory lined or insulated with heat insulating material encased in common brick not less than 4 inches in thickness, the clearances may be reduced to 6 inches at the sides and rear, and the clearances at the top may be reduced to 24 inches provided that the construction using combustible material above the charging door and within 48 in. is protected with No. 28 standard gauge sheet metal spaced out 1 inch, or equivalent protection.

SBC 8407 Mounting

(a) Listed incinerators specifically listed for installation on combustible floors may be so installed.

(b) Incinerators shall be mounted on the ground or on floors of fire-resistive construction with noncombustible flooring or surface finish with no combustible material against the underside thereof, or on fire-resistive slabs or arches having no combustible material against the underside thereof. Such construction shall extend not less than 12 inches beyond the incinerator base on all sides except at the front or side where ashes are removed where it shall extend no less than 18 inches beyond the incinerator.

(c) Incinerators may be mounted on floors other than as specified in (b) preceding provided the incinerator is so arranged that flame or hot gases do not come in contact with its base and, further, provided the floor under the incinerator is protected with hollow masonry not less than 4 inches thickness, covered with sheet metal not less than 24 standard gauge. Such masonry course shall be laid with ends unsealed and points matched in such a way as to provide a free circulation of air from side to side through the masonry. The floor for 18 inches beyond the front of the incinerator or side where ashes are removed and 12 inches beyond all other sides of the incinerator shall be protected with not less than ¼ inch asbestos millboard with sheet metal of not less than No. 24 standard gauge or with protection equivalent thereto.

(d) Incinerators which are set on legs that provide not less than 4 inches open space under the base of the appliance may be mounted on floors other than as specified in (b) preceding provided the appliance is such that flame or hot gases do not come in contact with its base, and further provided the floor under the appliance is protected with asbestos millboard not less than ¼ inch thick covered with sheet metal of not less than No. 24 standard gauge. The above specified floor protection shall extend not less than 18 inches beyond the front of the incinerator or side where ashes are removed and 12 inches beyond all other sides of the incinerator.

SBC 8408 Draft Hood Prohibited. Draft hoods shall not be installed in the vent connector of an incinerator.

SBC 8409 Vent Connector Clearance. Vent connectors shall have at least 18 inches clearance from combustible material and shall not pass through combustible walls unless guarded at the point of passage as specified in Table 7, Chapter 78 of this Code.

SBC 8410 Vent Connector Material. The vent connector from an incinerator to a chimney shall be galvanized steel to a thickness at least No. 24 standard guage or of a material having equivalent or superior heat and corrosion resistant properties and the joints shall be secured by sheet metal screws.

SBC 8411 Chimneys. All incinerators shall have their chimneys in compliance with Chapter 74 of this Code and the applicable sections of the State Building Code.

SBC 8501 FIRE CONTROL. General Regulations

(1) Scope.

The provisions of this chapter shall apply to design, construction, and installation of fire dampers, smoke dampers and fire control assemblies in duct systems, in inlets to or outlets from duct systems or ventilating openings (transfers) where such ducts penetrate or for openings that are provided in fire walls, fire partitions or in fire resisting walls and ceilings and floor or roof assemblies. See NFPA No. 90A Standard for the Installation of Air Conditioning and Ventilation Systems.

(2) Equipment and Assemblies Approved.

Fire dampers, fire doors and other fire control assemblies required under this chapter, for which the Underwriters Laboratories, Inc. provides testing and approval service, shall be tested, approved and listed by the Underwriters Laboratories Inc. or shall be approved by the administrative authority. When such dampers and equipment are not listed by Underwriters Laboratories, the administrative authority shall require tests to be performed by a qualified, independent laboratory where there are test procedures established, and may require such tests as he deems necessary for equipment and assemblies for which no standard test is provided in order to determine the acceptability of any such fire damper, smoke damper or control assembly.

SBC 8502 Fire Control Assemblies Required

(1) Fire Walls — Where ducts, or the outlets from or inlets to them pass through a fire wall or where a ventilating opening (transfer) exists in a fire wall, they shall be provided with an automatic fire assembly approved for the protection of openings in fire walls (Class A openings) on both sides of the wall through which the opening exists.

(2) Fire Partitions — Where ducts or the outlets from or inlets to them pass through a fire partition or fire enclosure of a vertical shaft, or where a ventilating opening (transfer) exists in a fire partition or fire enclosure of a vertical shaft, they shall be provided with an approved automatic fire damper, except as otherwise provided herein.

(3) Fire Resisting Walls — Openings in fire resisting walls other than fire walls, fire partitions and required shaft enclosures shall be protected as provided herein.

(a) Walls Requiring A Fire Resistance of More Than One Hour — Where ducts or outlets from or inlets to them pass through walls which are required to have a protection of more than one hour, or where a ventilation opening (transfer) is provided in such wall, such opening shall be protected with approved fire dampers.

(b) Walls Requiring A Fire Resistance of One Hour or Less — Where outlets from or inlets to duct systems are provided in walls which are required to be fire resisting with a rating of one hour or less and are required for area separation and where ventilation openings (transfer) are provided in such walls, such openings shall be protected with approved fire dampers.

(4) Fire Resisting Ceilings — Where inlets to or outlets from a duct system are provided in fire resisting ceilings which are part of a required fire

resisting ceiling and floor or roof assembly, such inlets or outlets shall be protected in accordance with the approved design.

(5) Fire Resisting Floors — Where ducts pass through a fire resistive floor, approved fire dampers shall be provided, except as otherwise herein provided and except when such ducts are encased or enclosed in a shaft as provided in NFPA No.. 90A.

(6) Ducts Serving Two or More Floors — Where a duct system serves two or more floors, approved automatic fire dampers shall be provided at either, each direct outlet or inlet in the enclosure for a main vertical duct, or at each point where such main vertical duct pierces the enclosure for a main vertical duct when such enclosure is required for the protection of vertical openings in the building.

SBC 8503 Fire Dampers Not Required

(1) Fire dampers are not required in branch ducts or in ducts that pierce the floor at one place only, when such ducts are less than 20 square inches in area and supply air conditioning units in one story only that discharge air at not over 4 feet above the floor.

(2) Fire dampers are not required in ducts serving small buildings with unprotected floor openings and in duct systems serving only one floor and used only for the exhaust air to the outside and which do not penetrate a fire wall or fire partition or pass entirely through the enclosure of a vertical shaft.

(3) Fire dampers are not required where branch ducts connect to a return riser in which the flow is upward and subducts at least 22 inches in length are carried up inside the riser from each outlet (See NFPA No. 90A).

SBC 8504 Construction and Installation of Control Assemblies

(1) Automatic Fire Doors.

(a) Fire doors shall be approved for the protection of openings in fire walls (Class A openings) See NFPA No. 80 Fire Doors and Windows.

(b) Fire doors shall be arranged to close automatically and shall remain tightly closed during the fire. Fire doors shall be so arranged that the disruption of the duct will not cause a failure in the protection of the fire wall opening. Fire doors required in this chapter shall close upon the operation of an approved fusible link or other approved heat actuated device located where readily affected by an abnormal rise in the temperature in the duct or opening. Such fusible link or device should have a temperature rating of approximately 50° F. above the maximum temperature that would normally be encountered with the system is in operation or shut down.

(c) Suitable access openings (hand holes) shall be provided to make all fire doors accessible for inspection and servicing.

(2) Automatic Fire Dampers.

(a) Fire dampers shall have a 1½ hour standard fire protection rating in accordance with NFPA No. 252 Standard Method of Fire Tests of Door Assemblies, except for dampers protecting openings in rated fire resisting ceilings which shall be in accordance with the approval. Fire dampers used for the protection of ventilating openings (transfers) in fire resisting walls shall be approved by the administrative authority.

(b) Fire dampers shall be arranged to close automatically, remain in a closed position and provide the maximum practical barrier to the passage of air when in the closed position. They shall be so arranged as to stay in place at the protected opening even if the duct should be disrupted during the fire. Automatic closing of the fire damper shall be effected by the operation of an approved fusible link or other approved heat actuated device located where readily affected by an abnormal rise in temperature in the duct space or opening. Such fusible link should have a temperature rating approximately 50° F. above the maximum temperature that would normally be encountered with the system in operation or shut down.

(c) Fire dampers shall be corrosion resistant and when installed in ducts used solely for exhaust air to the outside shall be installed in such a way that they will not interfere with the flow of air in the main duct.

(d) Suitable access openings (hand holes) shall be provided to make all fire dampers accessible for inspection and servicing.

SBC 8505 System Controls Required

(1) Manual Emergency Stop — Each installation shall be equipped with a manual emergency stop located at a conveniently accessible point approved by the administrative authority in order to be able to quickly shut down the fan in case of fire.

(2) Systems Between 2000 cfm and 15000 cfm — Shall be arranged to shut down automatically when the temperature of the air in the system becomes excessive as from a fire. This connection shall have approved thermostatic devices provided as follows:

One device with a setting not in excess of 125° F. at a suitable location in the return air stream ahead of the point of exhausting from the building or being diluted by outside air, and one device with a setting not in excess of 50° F. above the maximum operating temperature, at a suitable location in the main supply duct on the downstream side of the filters. The thermostatic device shall be of the manually reset type or the control system shall be such that some manual operation is required to restart the fan after the thermostatic device has operated. Smoke detectors approved for duct installation may be used in lieu of thermostatic devices.

(3) Systems Over 15000 cfm — Shall be provided with approved smoke detectors so installed and arranged to automatically shut down the main supply duct and the main return duct, so arranged to close automatically when the system is not in operation when the smoke detecting apparatus operates or when the fan is stopped by the manual emergency stop. Based on the foregoing requirements, the approved smoke detectors shall be provided at a suitable location in the return air stream ahead of the point of exhausting from the building or being diluted by outside air, and at a suitable location in the main supply duct on the downstream side of the filters.

(4) Systems Incorporating Automatic Exhaust — Automatic fan shut down as required in (2) and (3) will not be required when an automatic exhaust system is provided. Automatic smoke detectors shall be required for such systems.

(5) Smoke Detection on Systems Under 15000 cfm — Means for the detecting and controlling of the spread of smoke in air delivery systems which are under 15000 cfm are recommended and shall be required on all such systems in premises where panic hazard is pronounced.