





# CONDITION ASSESSMENT OF BUILDINGS

Non-destructive Test  
 Destructive Test

## CONCRETE

	Visual-Optical	Rebound	Pullout	Penetration	Dynamic	Electrical	Magnetic	Load	Acoustic Emission	Acoustic Impact	Ultrasonics	Radiographic	Microwave Absorption	Neutron	Moisture Gauge	Neutron Activation	Radar	Infrared	Core Drilling	Petrography
Thickness of Slabs	13					19					23	23					30		33	
Size and Location of Electrically Conductive Components						19	20				23	25					30		33	
Quality of Concrete	13 15	16		17	26						23 26	23	25						33	33
Quality of Aggregate	13 15																		33	33
Uniformity	13 15	16		17	26						23 26	23							33	33
Variable Compaction											23 26	23							33	33
Compressive Strength		16	31	17	26						26								33	
Moisture Content						18							25	27						
Cement Content															27				33	33
Density and Internal Structure											26	23							33	33
Modulus of Elasticity					26		29		22	26										
Condition of Reinforcing	15					19					23								33	33
Surface Flaws	13	16						21		26									33	33
Internal Flaws (Voids, Cracks, etc.)	15							21	22	26	23							28	33	33
Voids in Grouting of Post-tensioned Prestressed Concrete											23									
Joint Deficiencies	14																			
Substratum Voids																	30			
Load Distribution and Strain	13																			
Bonding Stress											23									
Failures under Stress							29													
Differential Structural Movements	14																			

## MASONRY

	Visual-Optical	Ultrasonics	Radiographic	Ink	Chemical	Autoclave Pressure	Spray Chamber	Wick	Hammer	Pachometer	Air Pressure	Freeze-Thaw	Weight	Load
Flexural Bond Strength														72
Diagonal Tensile Strength														72
Shear Strength														72
Modulus of Rupture														72
Compressive Strength		76												72 74 76
Water Absorption													72 74	
Freeze-Thaw Resistance											72			
Size	73													
Warpage	73													
Imperviousness			73		74									
Chemical Resistance				73										
Crazing					73									
Opacity			74											
Air Content										74				
Structural Soundness									75					
Location & Uniformity of Inner Cell Grout	75													
Wall Thickness	75													
Internal Voids		76	76											
Reinforcement Location			76							76				
Efflorescence								74						
Modulus of Elasticity														75

## WOOD

	Visual-Optical	Penetration	Electrical	Radiographic	Pulse Velocity (Ultrasonic or Impact)	Stress Waves	Weight Test (Oven Drying)
Extent of Decay	44 46			50	51		
Degree of Decay		46					
Density		46		50			
Strength	45	46		50	51		
Grade	45						
Moisture Content		48 49 50		53			53
Modulus of Elasticity				50	51		
Internal Flaws				50	51		
Grain Direction				53			
Location of Structural Members				53			

## HVAC

	Visual-Optical	Electrical	Ultrasonics	Air Pressure	Tracer Gas	Thermography	Color Changing Agents	Hygrometer
Air Leakage Quantity				79	80			
Heat Leakage Source						81		
Humidity						81	82	
Heating System Efficiency	84	83						
Pipe & Tank Wall Thickness			85					

## PLUMBING

	Visual-Optical	Ultrasonics	Air Pressure	Water Pressure	Discharge
Safety & Sanitary Conditions	87				
Pipe Leaks				90	
Water Pressure				89	
Storage Adequacy				90	
Drainage & Vent Leaks			91	90	
Trap Siphonage					92
Thickness Gauging		85			

## ELECTRICAL

	Visual-Optical	Electrical	Megohm Voltage	Deferm'n	Circuit Analyzer	Circuit Breaker & Resistance
Circuit Faults	95	98			98	
Deteriorated Insulation	95	97	97			
Excessive Voltage Drops		97	97			
Circuit Breaker Condition		99				99

## METAL

	Visual-Optical	Ultrasonics	Radiographic	Liquid Penetrant	Magnetic Particle	Eddy Current	Coupon
Surface Flaws	13 58	61	63	58	65	64	
Subsurface Flaws		61	63		65		
Thickness Gauging		61	63			64	
Alloy Variations						64	
Heat Treatment Variations						64	
Strength						68	
Modulus of Elasticity						68	

### Background

This wall chart is based on *Selected Methods for Condition Assessment of Structural, HVAC, Plumbing and Electrical Systems in Existing Buildings*, NBSIR 80-2171 by Frank Luchen, James H. Pielert, and Thomas K. Faison. The original publication is available at The National Technical Information Service (NTIS) as document No. PB 81-186918.

The report is based on research done at the National Bureau of Standards under the sponsorship of the Department of Housing and Urban Development. Included in the report are brief descriptions of each of the methods and references which provide additional in-depth information. The report is an excellent state-of-the-art summary and is highly recommended as a useful reference.

### How to Use This Chart

Major headings identify building materials, and items listed vertically below each major heading identify characteristics of the material for which tests are available. Material tests are identified across the top of each small chart. The number at the intersection of the material characteristic line and the material test column is: 1, an indication that the test applies to the characteristic, and 2, is the page number in the original publication on which additional information can be found.

The NBS publication NBSIR 80-2171 provides this information in a sequence which begins where this chart ends—describing the tests, how they are performed, the advantages and limitations of each, and gives references which provide even greater levels of detail. This chart and the book are designed to be used together.

U.S. DEPARTMENT OF COMMERCE  
Malcolm Baldrige,  
Secretary

NATIONAL BUREAU OF STANDARDS  
Ernest Ambler,  
Director



## CONDITION ASSESSMENT OF BUILDINGS NBS LETTER CIRCULAR LC1130

Porter Driscoll  
James Pielert

Center for Building Technology  
National Bureau of Standards  
Washington, D.C. 20234

