Department of Energy

Condition Assessment **Survey** **(CAS)** Program

Deficiency Standards & Inspections Methods Manual

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CAS PROGRAM OVERVIEW

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INTRODUCTION

GENERAL

Welcome to the DOE Condition Assessment Survey (CAS) Program. In the next few pages you will be introduced to a new way of seeing familiar things. As an introduction to CAS, this Program Overview will explain how the various parts of CAS have been developed and Integrated to meet the needs of DOE sites, Field Offices, and Headquarters. Our discussion will center around three broad topics:

- WHY CAS?

  This section will discuss issues DOE has faced in previous inspection approaches and explain the CAS goals of providing creative “standardized” solutions.

- WHAT IS CAS?

  Here, key elements of the CAS Program and how they relate to each other will be examined.

- HOW IS CAS IMPLEMENTED?

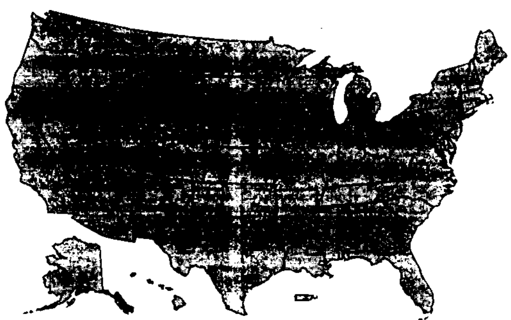
  Strategies for beginning to use CAS and the key roles facility managers and CAS inspectors play within the CAS process are detailed.

Again, welcome to the CAS Program. Your role in this program is essential to its overall success

INTRODUCTION

WHY CAS?

DOE NATIONWIDE INVENTORY:



- 10,000 BUILDINGS AND 15,000 STRUCTURES ON 52 SITES NATIONWIDE
- LACK OF DOE STANDARDS
- VARYING DEGREES OF INSPECTION
- INCONSISTENT RESULTS LEADING TO INEQUITIES AMONG SITES

INTRODUCTION

WHY CAS? - The State of DOE

The use of standards, from simple weights and measures to complex computer language, has been a fundamental part of human development. Because of standards, we can be assured that a meter of length in one place is the same in another. This question of standards has become increasingly important for DOE. Over the past 50 years, DOE and predecessor agencies have been at the forefront of the nation's technical advances. This investment has left the department a vast array of facilities under its care. With 10,000 facilities and 15,000 miscellaneous structures comprising over 100,000,000 square feet at 52 sites across the country, the problem of design, construction, and maintenance of all DOE physical plants is acute. Add aging facilities, revised missions, and changing technology, and condition assessment becomes a vital tool to use to ensure facilities will continue to meet DOE's and the nation's program goals.

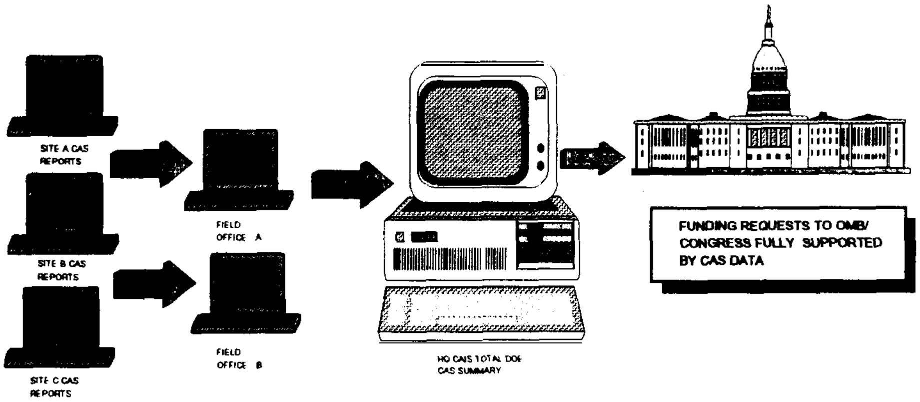
The current state of condition assessment across all DOE assets is mixed. While DOE regulations dictate facility assessments be made, no one methodology is mandated to conduct them. As a result, DOE surveys have varied from site to site, with some locations providing exhaustive in-depth analysis while others have used a more limited approach. Because of such different interpretations, it is difficult to judge the validity and comparability of data being provided. This, in turn, has led to funding requests that cannot be fully substantiated to Congress.

This lack of standards for use in the facility assessment process and the resultant inconsistencies in developing program budgets have convinced DOE that a standardized, clearly defined methodology for condition assessment is essential to support DOE's program missions.

INTRODUCTION

WHY CAS?

- ASSESS PHYSICAL CONDITION OF EXTENSIVE AND VARIED DOE FACILITY AND EQUIPMENT INVENTORY
- STANDARDIZE INSPECTION PROGRAM FOR ALL SITES
- IDENTIFY REPAIR/REPLACEMENT NEEDS TO FACILITATE KEY BUDGET DECISION MAKING
- DEVELOP SUPPORTABLE FUNDING REQUESTS BASED ON “UNIVERSAL” STANDARDS



INTRODUCTION

WHY CAS? - Four Key Requirements

In today's economic environment, it is essential that the DOE knows with confidence the condition of its vast asset inventory. To accomplish this, a method to review all DOE assets in a "standardized" approach is required. In designing guidelines for such a program, DOE established four key requirements:

Assess Physical Condition of All Assets:

To be valid, all sites eventually must be included in the program. Universal participation will ensure that all DOE sites and installations will be using the same "score card."

Standardize Inspection Programs:

To remove the problem of inconsistent and misinterpreted facility inspection data, a "standard" evaluation method used by all DOE sites is required. Results from such a program will allow DOE to determine a "base condition" for all of its assets.

Identify Repair/Replacement Funding:

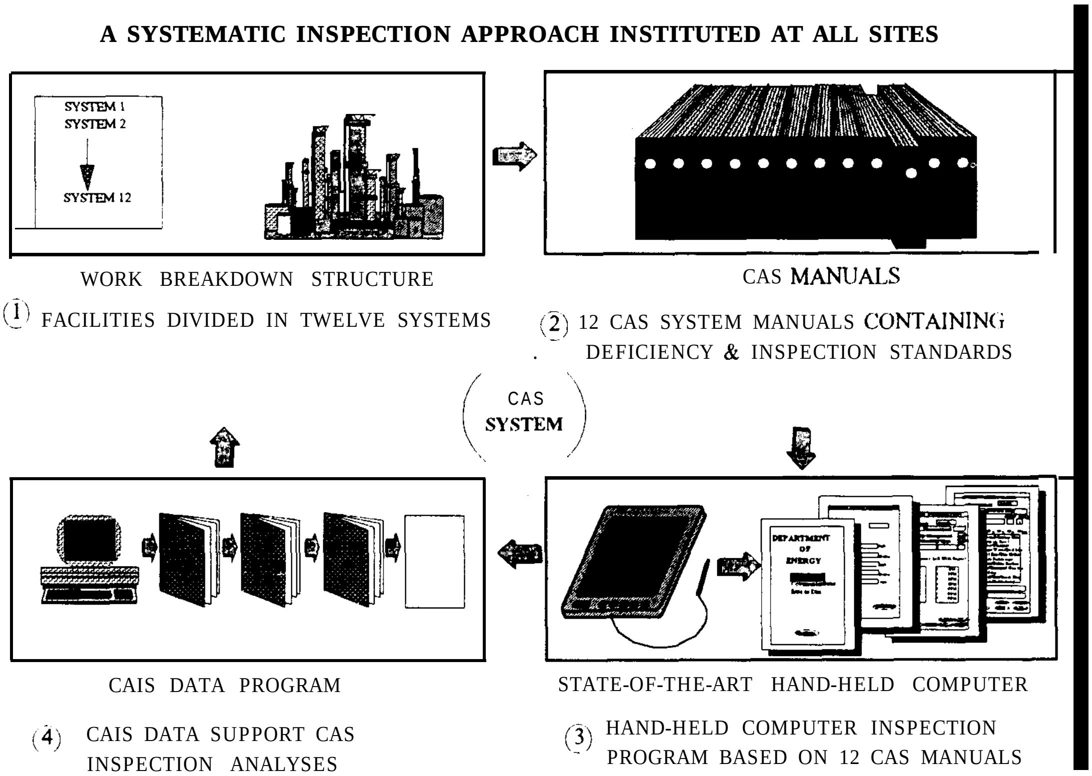
Using inspection data from all sites, a general picture across all DOE assets and programs can be used to direct limited resources to crucial areas. Standardized reports form "a level playing field" to ensure that all programs and missions will receive a fair analysis.

Develop Supportable Funding Requests:

In today's atmosphere of fiscal constraint, requests for funds from Congress require extensive justification, backed up by reliable, consistent field data, if such programs are to be successfully supported.

INTRODUCTION

WHAT IS CAS?



INTRODUCTION

WHAT IS CAS? - The Work Breakdown Structure (WBS)

The CAS system has been developed to answer the critical questions facing DOE. Using state-of-the-art hand-held computers and system software programs, the CAS process will establish a systemized, standard approach to facility and asset evaluations. This program will help DOE provide the necessary assets as it seeks to bring our nation's premier research and development agency into the year 2000 and beyond.

The condition assessment process involves evaluating separate building "systems" that comprise the entire facility. These systems traditionally fall under three broad professional disciplines: architectural (including structural), mechanical, and electrical. Specialty assessments (e.g. industrial hygiene, chemical engineering) are usually performed as adjuncts to these primary disciplines when required. The WBS employed under CAS is based on the 12 system assemblies that R.S. Means employs in its square foot cost analysis. Using this system as a foundation to define assemblies and components in the CAS Program will create a direct link to a broadly accepted industry-wide standard.

TABLE ONE

WORK BREAKDOWN STRUCTURE

SYSTEM (R.S. MEANS CAT.)	CONTROL NO.
FOUNDATIONS & FOOTINGS ...	0.01 SYSTEM
SUBSTRUCTURE	0.02 SYSTEM
SUPERSTRUCTURE	0.03 SYSTEM
EXTERIOR CLOSURE	0.04 SYSTEM
ROOFING..	0.05 SYSTEM
INTERIOR FINISHES & CONSTRUCTION	0.06 SYSTEM
CONVEYING SYSTEMS	0.07 SYSTEM
MECHANICAL SYSTEMS..	0.08 SYSTEM
ELECTRICAL SYSTEMS..	0 09 SYSTEM
*PROD/LAB/OTHER EQUIPMENT..	0.10 SYSTEM
SPECIALTY SYSTEMS..	0.11 SYSTEM
SITEWORK	0.12 SYSTEM

CONSTRUCTION SPECIFICATIONS

DIVISION **(MASTERFORMAT)**	DESCRIPTION
01000	GENERAL REQUIREMENTS
02000	SITEWORK
03000	... . CONCRETE
04000	MASONRY
05000	... . METALS
06000	.... WOOD & PLASTICS
07000	. ..THERMAL &MOISTURE PROTECTION
08000	DOORS &WINDOWS
09000	... . FINISHES
10000	SPECIALTIES
11000	EQUIPMENT
12000	... . FURNISHINGS
13000	............................SPECIAL CONSTRUCTION
14000	.... CONVEYING SYSTEMS
15000	MECHANICAL
16000	.ELECTRICAL

The WBS of the CAS Program will be linked to the MASTERFORMAT system developed by the Construction Specifications Institute (CSI) and used as the basis for the DOE Design Guide (DOE 6430.1A). These CSI numbers will be referenced after each system assembly and component in the CAS Manuals as follows:

EXAMPLE: Roofing (CSI 07000)

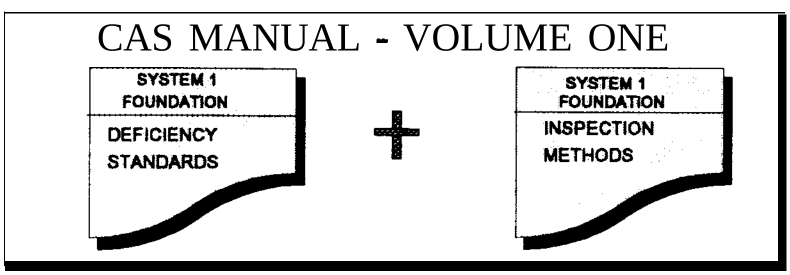
*NOTE: This section supersedes Means 0 10 category and includes FIS 700 Series Asset Codes

INTRODUCTION

WHAT IS CAS?

DEFICIENCY STANDARDS & INSPECTION METHODS MANUAL

- DEVELOPED SEPARATELY FOR EACH SYSTEM
- DEFICIENCY STANDARDS CONTAIN NARRATIVE AND GRAPHICS FOR DESCRIBING DEFICIENCIES AFFECTING SYSTEM ASSEMBLIES
- INSPECTION METHODS CONTAIN PROCEDURES TO IDENTIFY TYPE, SEVERITY, AND PERCENT COVERAGE OF EACH COMPONENT OR SYSTEM DEFICIENCY ILLUSTRATED



INTRODUCTION

WHAT IS CAS? - DOE CAS Manual Format

Using these 12 systems as the basic organizing principal, the DOE CAS Manual will contain Deficiency Standards and Inspection Methods It will be divided into 12 volumes corresponding to these established WBS systems The Internal organization of manuals is outlined below.

SECTION 1 - SYSTEM INFORMATION

1.1 Asset Determinant **Factor/CAS** Repair **Codes/CAS** Cost Factors - Discusses the Asset Determinant Factor (ADF), a decision matrix used to provide a graded approach to inspections commensurate with the use and relative importance of the asset inspected. Also addresses the CAS repair codes, and a general overview of cost estimating techniques.

1.2 Guide Sheet Tools **&** Materials Listing - Contains tools and materials groups used in conjunctron with the inspection methods process for the system outlined in each volume.

1.3 Testing Methods - Contains the specific requirements for testing methods applicable to the systems

1.4 Inspection Frequency - Schedule of CAS inspection frequencies for systems/components.

1.5 Standard System Deslgn **Life** Tables - Standard design life tables for the system assemblies/components.

1.6 System Work Breakdown Structure **(WBS)** - Complete listing of all assemblies/components.

1.7 General System/Material Data - General material data relevant to system deficiency problems. (Optional, not included for all systems.)

SECTION 2 - DEFICIENCY STANDARDS

Each major assembly/component is defined by a brief narrative and accompanying graphic(s) that visually illustrate the general characteristics. Major deficiencies affecting this assembly/component are described, including probable failure points. A deficiency characteristics profile and graphic illustrations are provided with each deficiency defined.

SECTION **3** - INSPECTION METHODS

This section contains discussions of methods and procedures involved in inspecting each of the WBS systems Each system contains an Inspection Method, including a narrative and a System/Component Inspection Guide Sheet Listing that provides a general overview for each defined major assembly/component type. This information will be developed for Standard and Non-Standard Inspections and testing methods that would be used in conjunction with Standard or Non-Standard Inspection Methods. Also included is a simulated example, “walking” the inspector through the data collection process.

SECTION 4 - REFERENCES

All major reference standards used and/or associated with the system are described, including government, industry, and DOE references

APPENDICES

Appendix A **Abbreviations** - All abbreviated terms contained in the CAS manuals

Appendlx B Glossary - All technical terms directly related to the particular systems discussed will be defined in this subsection.

Appendix C Technical **Bulletins/Updates/Advisories** - This subsection contains technical information issued by the government and/or private industry that may affect specific data as developed in the particular volume DOE guidelines may also be included in this subsection

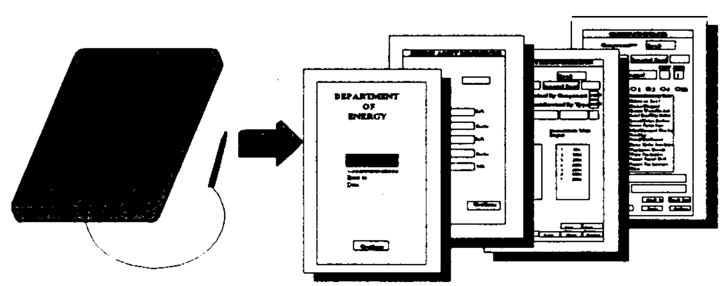
Appendix D Revisions Summary - All revisions listed in chronological sequence. The last revision listed will be the most current modification.

INTRODUCTION

WHAT IS CAS?

STATE-OF-THE-ART TECHNOLOGY STREAMLINES FIELD CONDITION ASSESSMENT SURVEY PROCESS

- HAND-HELD COMPUTER "PROMPTS" INSPECTOR WITH PRELOADED SOFTWARE SYSTEM "MENUS"
- INSPECTOR SELECTS DEFICIENCIES. SEVERITY. PERCENTAGE OF COVERAGE, LOCATION, ETC. FROM "MENU" SYSTEM



INTRODUCTION

WHAT IS CAS? . State-Of-The-At Technology

At the outset of this introduction, we talked about a “new way” of seeing familiar things. The traditional methods of facility assessment inspection, using hard copy forms then entering data either by laptop or into a PC, have given way to a new, exciting technology: The Pen-Based Computer. This hardware, and the Condition Assessment Information System (CAIS) software developed to support it, form the heart of the DOE CAS data collection process. Using the CAS manuals as the basis to develop the inspection process, CAIS software will create pre-stocked survey “menus”. These will be used to record defined deficiencies in terms of severity and coverage. With this user-friendly device, inspectors will simply use a pen-like device to record their observations directly on the prompted inspection screens developed for each system.

The advantages in using this technology for the DOE CAS Program are exceptional. The efficiency gained by using the hand-held computer technology to prompt the inventory and facility inspection process will be significant. This eliminates the manhour-intensive and error-prone process of converting manually developed data into an automated database. This technology system ensures that all pertinent data is collected, guiding the inspector through each step of the process. This method will significantly enhance the effectiveness of quality assurance/quality control of the DOE CAS Program, permitting editing as data is entered, eliminating illogical or erroneous choices.

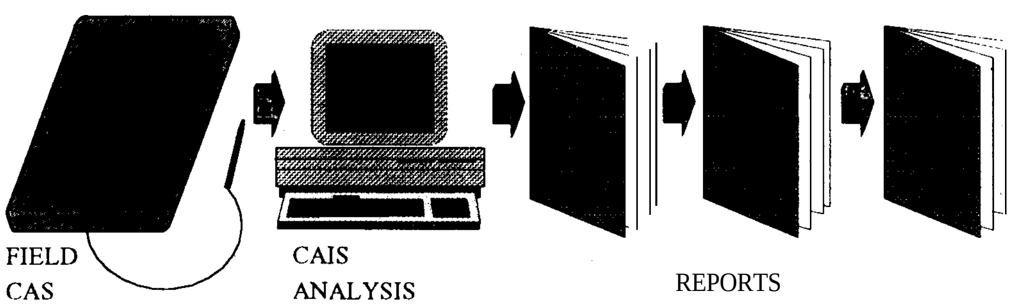
In short, the CAS process will be conducted in a carefully structured, “standardized” manner to ensure that the quality of raw inspection data is consistent throughout all DOE installations.

INTRODUCTION

WHAT IS CAS?

CAIS PROGRAM FOR HAND-HELD & PCs SUPPORT THE CAS PROGRAM

- INSPECTION DATA DOWNLOADED TO PC-BASED CAIS PROGRAM
- DATA ANALYZED, CATEGORIZED, AND SORTED
- REPORTS GENERALIZED, INCLUDING UNIVERSAL AND SUMMARY VERSIONS
- REPORTS WILL INCLUDE DEFICIENCY DESCRIPTIONS, COSTS TO REPAIR/REPLACE, AND SCHEDULE



INTRODUCTION

WHAT IS CAS? - The CAIS Connection

Asset condition information is uploaded directly to the PC and the CAIS program, eliminating the laborious hand input of data. If the hand-held is the "eyes and ears" of CAS, then the CAIS database is the "brain." In the program, raw data is sorted and analyzed to create CAS reports. Several key factors are determined during the process:

Deficiencies Affecting Survey Assets:

The inspector describes each deficiency noting its severity and coverage, i.e. how much of the component or assembly reflects the deficiency. The inspector also codes each component or assembly as to condition and the urgency and purpose of proposed repair or replacement actions.

Corrective Repairs:

Based on these recorded deficiencies, corrective actions and their associated repair codes are defined and processed by the CAIS database.

Project Costs:

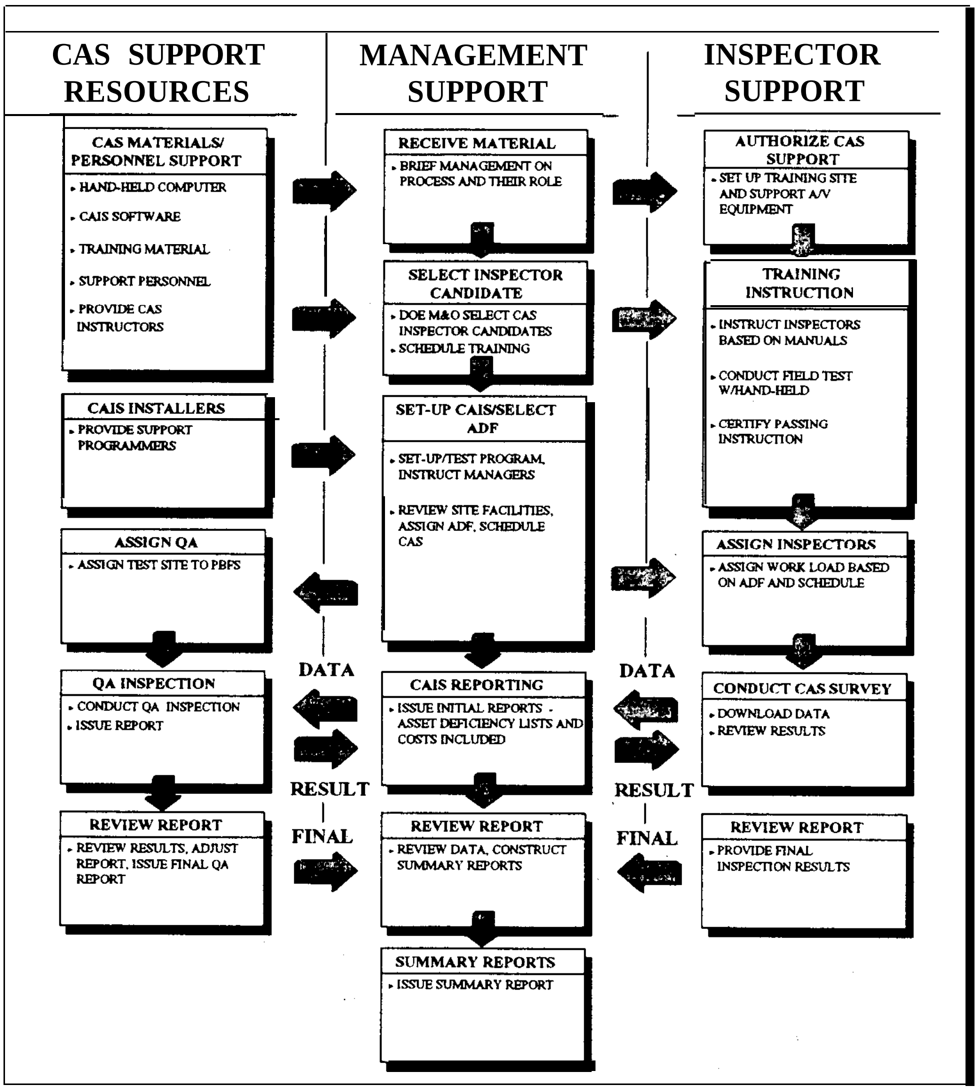
Costs to accomplish repairs and replacements are generated by the manipulation of field data in the CAIS program, which employs several methods including determining cost as a percentage of total replacement and/or direct entry of costs. (See Section 1, Subsection 1.1 for discussion of cost development.)

Asset Reports:

Preformatted reports and tables are generated by the CAIS System. Report types include "universal" reports listing all deficiencies and observations recorded by the Inspector, summary asset reports, and summary site reports. Data within the CAIS system can also be manipulated readily to create "custom" reports.

INTRODUCTION

HOW IS CAS IMPLEMENTED?



INTRODUCTION

HOW IS CAS IMPLEMENTED? - Support Roles

While CAS manuals, hardware and the CAIS database are the main building blocks of the CAS Program, CAS support personnel will form the standing framework. Your role in the implementation process is crucial if the CAS system is to succeed. In reviewing this process, three key support groups are highlighted.

CAS Contractor Support Personnel:

In conjunction with DOE managers and Site Management & Operations (M&O) contractors, CAS contractor support personnel will work closely with DOE in setting up and conducting the training program, installing CAIS, and validating CAS through a Quality Assurance (QA) program. This team of CAS trainers, CAIS programmers, and QA engineers and architects will form, along with DOE M&O personnel, the strong team required to support the CAS Program as it proceeds.

Manager Support:

No group is more important in implementing CAS than the DOE managers and M&O contractors. Their in-depth knowledge of the sites and their personnel will help guide and strengthen the entire CAS system.

CAS Inspectors:

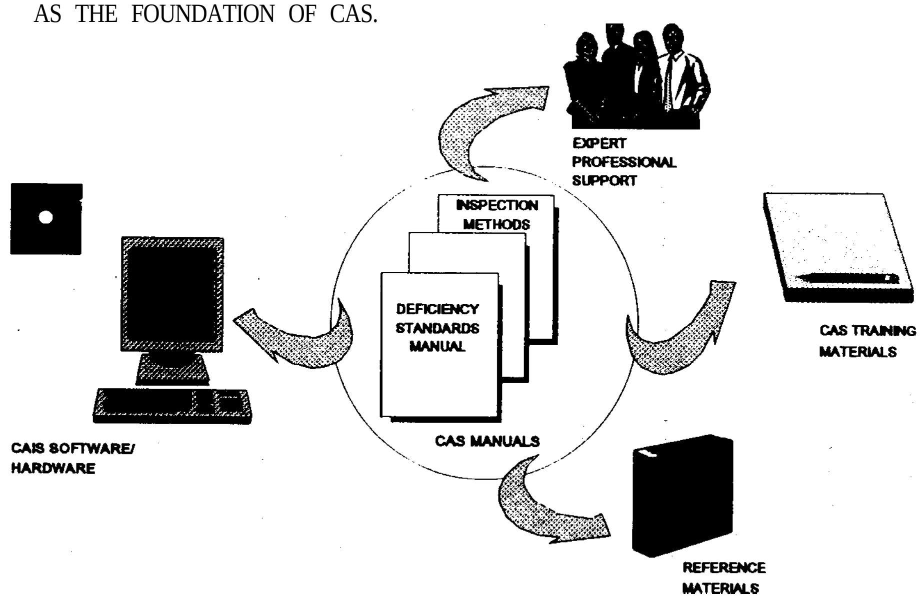
Without highly skilled, knowledgeable inspectors, the CAS Program will not succeed. The integrity of these inspectors and their expertise will ensure that the base data supporting the entire CAS process will be an accurate reflection of the condition of the DOE inventory of facilities and assets.

INTRODUCTION

HOW IS CAS IMPLEMENTED?

CAS SUPPORT RESOURCES

- DEFICIENCY STANDARDS AND INSPECTION METHODS MANUALS SERVE AS THE FOUNDATION OF CAS.



INTRODUCTION

HOW IS CAS IMPLEMENTED? . CAS Support Resources

We have spoken generally of the CAS Process and those resources (manuals, hardware, CAIS software) required to implement the system. Additionally, the CAS contractor will supply all of the technical personnel to support, implement, and guide the CAS Program. Among those key professionals are:

CAS Training Instructors:

Professionals with a technical background and well-versed in training methods, will train CAS inspector candidates. Their mission will be to instruct and guide CAS inspector candidates through the entire process, supervise field exercises, and provide final testing. Their goal is that all candidates will be successful participants in the CAS Inspection process.

CAIS Programmers:

A key CAS Program element is the CAIS. Expert programmers will supervise the installation of the PC-based program and provide guidance and instruction for DOE M&O managers in using the system.

CAS/CAIS Hotline:

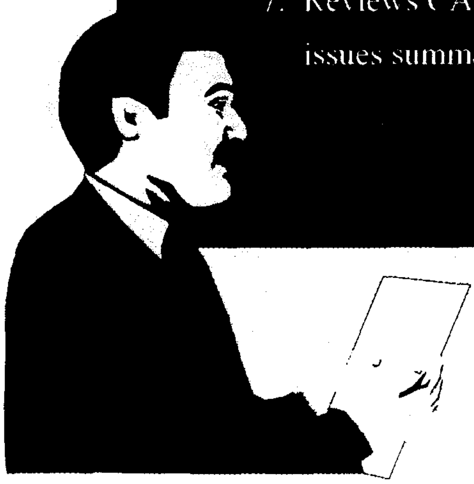
The Contractor will provide support resources in order to field questions from various site locations. Expert engineers, architects, and computer programmers will answer with written and/or verbal responses all inquiries originating from the field.

INTRODUCTION

HOW IS CAS IMPLEMENTED?

MANAGEMENT KEY ROLES

1. Coordinates CAS program implementation
2. Sets up training location & equipment support
3. Selects CAS inspector candidates
4. With CAS CAIS contractor, coordinates CAIS installation and testing
5. Analyzes site assets and assigns Asset Determinant Factor (ADF)
6. Schedules inspection
7. Reviews CAIS reports, provides analysis, and issues summary reports



INTRODUCTION

HOW IS CAS IMPLEMENTED? • The Manaaement Role

The critical role DOE M&O managers will play in the CAS process cannot be overstated. Their understanding and direct input will guide the construction of the CAS Program. Their chief responsibilities are:

Initial Implementation:

CAS start-up will include a general briefing by the CAS contractor at designated sites to instruct all key managers in the process and their responsibilities. DOE M&O management actions include training site set-up (to hold maximum of 25 students), arrangements for required A/V equipment (overheads, slide projectors, etc.), and CAS inspector candidate selection (see Guidelines for Implementation of CAS Certification Training under separate cover).

Setting Up CAIS:

In conjunction with CAIS programmers, DOE M&O managers will be instructed in the function and various uses of CAIS software. Data input, system operation, report generation with predetermined report format, and how data can be manipulated to customize reports, will be examined during this training.

ADF Selection & CAS Schedule:

A vital element of the CAS Program is the development of a CAS "strategy." DOE M&O managers will be instructed in the use of the Asset Determinant Factor (ADF) to sort site assets into varied inspection effort levels. See Section 1, Subsection 1 .1 Asset Determinant Factor (ADF), CAS Repair Codes, and CAS Cost Factors. The ADF will guide the DOE M&O managers in scheduling the survey and assigning CAS Inspectors to various assets.

Report Analysis:

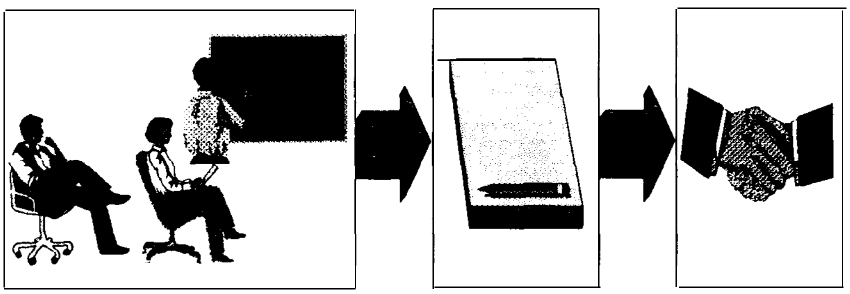
The process of up-loading CAS field data to the PC-based CAIS program will be demonstrated to the M&O CAS managers. Analysis processes will be examined using predetermined, formatted reports. Final management project "sorts" and prioritization schemes, and construction of summary reports for higher authorities, will comprise the basic CAS report development sequence.

INTRODUCTION

HOW IS CAS IMPLEMENTED?

CAS INSPECTOR CERTIFICATION

- INSPECTOR CANDIDATES ARE TRAINED, TESTED, AND CERTIFIED USING THE CAS PROGRAM



CLASSROOM TRAINING

TESTING

CERTIFICATION

INTRODUCTION

HOW IS CAS IMPLEMENTED? CAS Inspector Certification

While the CAS manuals, hand-held computer, and CAIS software program are the tools of the CAS system, the CAS Inspector is the system "operator." The old adage, "The data output is only as good as the data input," truly applies to the inspectors' role in the CAS process. As part of the effort to assure accurate, consistent results, the CAS Program includes an Inspector training phase that will "certify" all candidates in the use of the CAS system. It should be noted that it is not the training course's intent to train personnel to be inspectors: it is assumed that candidates will come to the CAS Program with a strong background and past experience in the disciplines they will inspect (see Guidelines for Implementation of CAS Certification Training (GICT) under separate cover for detailed information). Key phases of the course include:

Prequalification:

Based on experience levels set by GICT, candidates are selected by the M&O contractors and sent to the CAS training program.

Classroom Training:

Classroom instruction will be conducted at the sites selected by DOE. Course materials, based on the Deficiency Standards and Inspection Methods sections in the manuals, will clearly demonstrate the nature of the CAS system and how it is to be used. Hand-held computers will be used during the course. At course conclusion, these units will be turned over to the inspectors for use in the CAS Program and become the property of the site that the inspectors represent.

Field Exercise:

During the training course, a field exercise using the hand-held will be conducted at a predetermined test asset. This survey and its results will be an integral part of the inspection education program.

Certification Test:

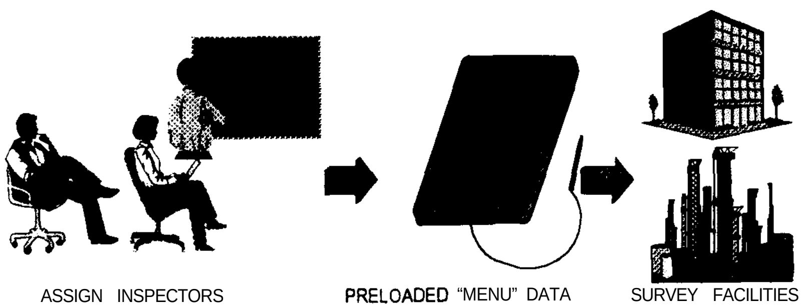
At the completion of the CAS training, each candidate is required to take and pass a written examination based on the material covered in the class. It is the goal of the training team to pass 100% of the candidates. Those having difficulty will receive additional instructor attention during the class as required. After passing this examination, candidates will be fully certified CAS Inspectors.

INTRODUCTION

HOW IS CAS IMPLEMENTED?

THE SURVEY PROCESS

- CERTIFIED CAS INSPECTORS FOR EACH MAJOR DISCIPLINE ARE ASSIGNED FACILITY ASSETS TO INSPECT
- PRE-LOADED SURVEY ROUTINES FOR EACH SYSTEM ARE PROVIDED THROUGH HAND-HELD COMPUTER CAS SOFTWARE PROGRAM



INTRODUCTION

HOW IS CAS IMPLEMENTED? - The Survey Process

At the completion of CAS training and upon the M&O managers' ADF asset selection and development of survey schedules, certified CAS inspectors will be assigned assets to inspect. This step initiates the CAS process, which will involve several major phases.

start-up:

The objective during start-up is to prepare a profile information file for the asset being surveyed and to verify preloaded information (RPIS data, name, and address, etc.). Such a review might include part and/or all of the material listed below:

- As-built and/or construction documents
- Square footage, type of construction, and age of each building
- Existing studies, surveys, and reports; and
- Existing repair, alteration, or construction projects

Conduct **CAS** Inspection/Evaluation:

With the benefit of the information contained in the asset file, the CAS Inspector will perform a thorough evaluation of the WBS systems required for each of the assigned assets. The Inspector will initially review the asset file to note particular problems. With this accomplished, the CAS Inspector will methodically survey each of his assets and record deficiencies (in terms of severity and coverage) and other observations on the preprogrammed hand-held computer. He accomplishes this data recording through "menu" screens contained in the CAS hand-held computer software, which will guide the CAS Inspector through the process (see Section 3 for full detailed information outlining step-by-step the CAS inspection process).

CAS Report Generated by **CAIS:**

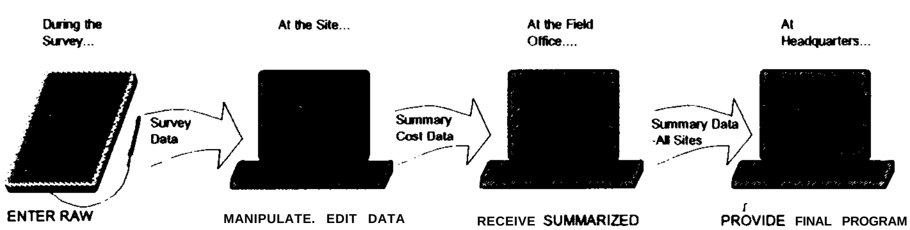
After completing the CAS Inspection, information is uploaded to the PC-based CAIS system. "Universal" reports showing all asset deficiencies, observations, associated cost, scheduling priorities, and repair purposes will be produced. As part of the QA, the Inspector will review this information with the manager to ensure that all aspects of the inspection asset information are correct.

INTRODUCTION

HOW IS CAS IMPLEMENTED?

SUMMARY REPORTS

- IMPROVE ACCURACY AND PROVIDE QA FOR ALL SITE INSPECTION DATA
- FINAL REVIEW OF PRELIMINARY REPORTS BY THE MANAGERS TO "PRIORITIZE" REPAIR/REPLACEMENT REQUIREMENTS FROM ASSET TO ASSET
- ISSUE SUMMARY RESULTS WITH FULL BACK-UP AT SITE



INTRODUCTION

HOW IS CAS IMPLEMENTED? - Report Development

With the completion of the CAS Inspector's survey, data uploaded into the PC-based CAIS ptogram is analyzed to provide the survey reports. The primary preformatted reports include:

"Universal" Report:

This document contains all the information recorded concerning deficiencies found in the WBS systems surveyed in each asset, The report lists all deficiencies and observations system by system. The summary section provides the cost of repairing surveyed asset deficiencies and repair codes showing condition, purpose, and urgency. Costs are calculated in CAIS based on deficiencies noted. Inspectors can also directly input repair costs either as a percentage of replacement costs or as an absolute dollar value.

Asset Summary Report:

This report contains summary asset deficiency data at the WBS system level only. The report lists deficiency/corrective repair action by codes (see Subsection 1 .1 for more information). All assets surveyed by the Inspector will be listed here. Manager input to these reports includes resorting the priority list (including additions and/or deletions) and recommendations.

Site Asset Summary Report:

After all inspector surveys have been processed, analyzed, and final recommendations input by the manager, this preliminary site-wide report lists all assets included and preliminary manager sorts (Asset Summary Report). Manager input includes selecting of final projects recommended for the budget cycle, including cost and priority schedules.

Site Summary Report:

This report, issued to DOE Headquarters, contains a site project summary and synopsis of back-up data. This report will serve as the basis for establishing the site maintenance and repair backlog which in turn supports funding recommendations to OMB and Congress.

OTHER REPORTS

QA Report:

As part of the QA process, the contractor QA team will randomly select assets inspected by site CAS Inspectors. Results will be analyzed to determine both accuracy and content of the CAS Program to ensure the validity of CAS procedures.

Custom Reports:

Data within the CAS/CAIS database can be manipulated to create various reports. Examples might include a report showing all site roofs, cost magnitude, and/or by building type.

INTRODUCTION

CAS SUMMARY

- STANDARD APPROACH TO CONDITION ASSESSMENT
- EASE/ACCURACY OF DATA COLLECTION
- SITE-CONTROLLED DATABASE
- SUMMARY DATA TO FIELD OPERATIONS & HQ LEVELS
- MORE CREDIBLE DOE BUDGET SUBMISSIONS

INTRODUCTION

THE CAS SYSTEM: - A Summary

In summary, the CAS System has been designed to support the vital process of creating a facility condition baseline that is founded on recognized, fully defined Standards. This established baseline will determine the direction and cost of future assets required to define the DOE's changing mission against a background of government fiscal constraint. As you have seen, your role in this overall program is vital if the CAS framework is to be created and supported. The CAS System is your tool for constructing the essential, realistic requirements needed to obtain budgetary funding. Obtaining these funds is the final measure of whether a site program will move forward or be eliminated.

We began this introduction by promising you a "new way" of seeing familiar things. The CAS Program's combination of state-of-the-art technology and the DOE M&O's talented professionals will be the essential mix to successfully initiate and sustain the CAS process.

INTRODUCTION

END OF SUBSECTION

ASSET DETERMINANT FACTOR/CAS REPAIR CODES/CAS COST FACTORS

GENERAL

The CAS Program is built on the physical analysis of each asset through the inspection of the major systems as defined by the WBS. System-specific deficiencies (as defined for each assembly/component in the Deficiency Standards section of this Manual) and the extent of their severity “bracket” the general asset conditions as of the inspection date. Recording actual deficiencies, however, is only part of the process. The CAS process also documents the urgency and purpose of repairs or replacements as well as the overall condition of the assembly/component surveyed.

The following elements are important parts of the CAS process and will be discussed in detail in this subsection:

- ASSET DETERMINANT FACTOR (ADF): Discusses various possible levels of CAS inspections, and the manager’s role in determining the type survey appropriate for each asset..
- CAS REPAIR CODES: Describes categories used by the inspector to document the urgency and purpose of repairs and replacements, and the general condition of the assembly/-component.
- CAS COST FACTORS: The general overview of CAS cost development and the factors used to build project costs are outlined in this section.

CAIS Interface:

As outlined in the Introduction “A CAS Program Overview,” the Condition Assessment Information System (CAIS) is a key element. CAIS software will provide critical data analyses required to process CAS raw field data, including repair codes and costing factors for recorded facility asset conditions. The CAS Manuals, the hand-held data collection device and software, and the CAIS Program together form the foundation of the CAS process.

In DOE’s vast inventory, asset conditions vary widely in terms of age and use, new or renovated facilities are mixed with assets built during the 1940s and 1950s. It is therefore recognized that not all assets at a given site require the full CAS inspection. The ADF has been developed as a tool that provides site facility managers with a means to categorize each site asset by identifying the type of survey to conduct.

CAS Survey Levels:

For the purposes of allowing flexible CAS Program implementation, three broad categories of asset inspections are defined:

- CAS - Base Level: Assessment is primarily a visual inspection (augmented in some instances by simple testing; eg., light level measured by light meter) recorded at the assembly level of the Work Breakdown Structure (WBS). Deficiencies typical to each assembly are recorded in terms of severity and coverage.
- CAS - Component Level: Provides more extensive inspection information based on conducting the assessment at a component level. Components are defined as major parts of an assembly.
- CAS - Limited: Survey not requiring assessments of all systems for a given asset.

ASSET DETERMINANT FACTOR/CAS REPAIR CODES/CAS COST FACTORS

ASSET DETERMINANT FACTOR (ADF)

Ten key categories to be used as ADF guidelines are illustrated below. These classifications are sensitive to key DOE criteria, including shor -term and mothballed facilities

ADF#	Guidance	Description	Systems
1	Existing asset (>3 years), program projected to last 5 years	Full CAS Inspection (base CAS - assembly level or optional component level) [1]	ALL
2	Existing temporary asset (>3 years) program projected to last < 5 vears	Limited CAS Inspection (base CAS - assembly level only)	ALL
3	Asset decommissioned - "warm mothball" (maintained for future unidentified function)	ARCH(ext), MECH & ELEC (base CAS - assembly level or optional component level) [1]	0.04, 0.05, 0.08. 0.09
4	Asset decommissioned - "cold mothball" (to be removed, dismantled, destroyed at some future date)	Exterior envelope (base CAS - assembly level only)	0.04, 0.05
5	Asset ROOF inspection only	ROOF inspection (base CAS - assembly level or optional component level) [1]	0.05
6	Asset ARCHITECTURAL only	ARCH/STRUCTURAL inspection (base CAS - assembly level or optional component level) [1]	0.01, 0.02, 0.03, 0.04, 0.05, 0.06, and 0.11
7	Asset MECHANICAL only	MECHANICAL inspection (base CAS - assembly level or optional component level including incidental electrical)'	0.07, 0.08
8	Asset ELECTRICAL only	ELECTRICAL inspection (base CAS - assembly level or optional component level) [1]	0.09
9	Asset SITE inspection only	SITE inspection (base CAS - assembly or optional component level) [1]	0.12
10	As developed by each site	As constructed by site [2]	As Required

GENERAL NOTES

1. Survey may combine levels (eg., ADF #1, Systems 0.01-0.06, 0.11, and 0.12 Assembly level survey, 0.07, 0.08, and 0.09 Component level survey)
2. Other surveys may be structured on an as-required by sites
3. ADF values are guidelines only and systems may be added to base ADF values as required

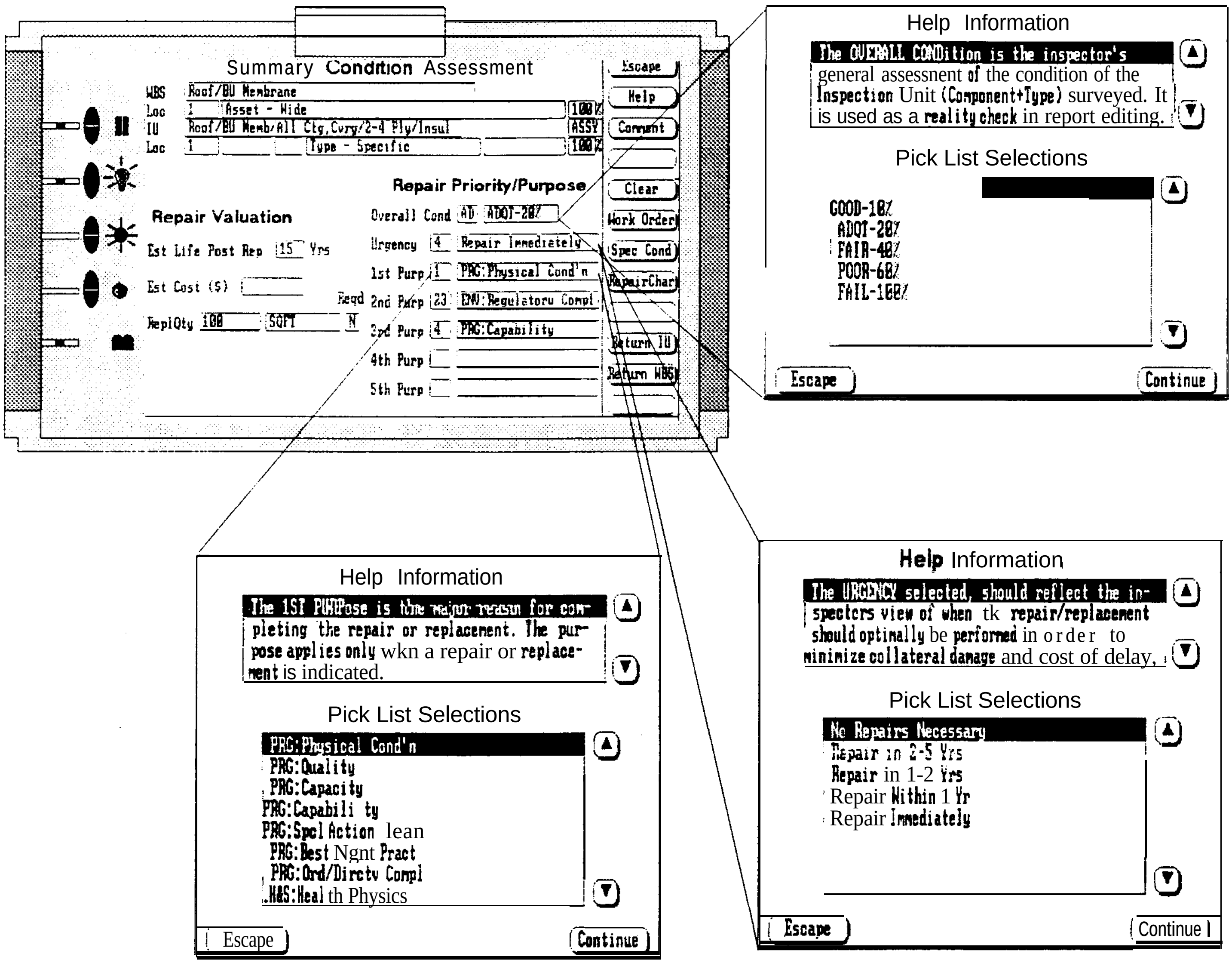
ASSET DETERMINANT FACTOR/CAS REPAIR CODES/CAS COST FACTORS

ASSET DETERMINANT FACTOR (ADF) (Continued)

ADF #	Definition
1	Assets within this factor represent "typical" DOE facility assets. These assets are over three years old and serve current programs projected to last over five years. A full CAS inspection at the assembly level is required. Component level CAS may be conducted as resources permit.
2	For temporary facilities supporting short-term programs (less than five years), a limited CAS inspection at assembly level involving all systems.
3	For currently unused assets that will be considered for future program development. In this case, only exterior envelope and interior mechanical and electrical systems are assessed at the assembly level.
4	For facilities deemed unfit for future use, a limited CAS inspection is recommended. This would involve exterior envelope only to ensure that asset will not deteriorate prior to scheduled decommission and disposal action (eg., destroy, dismantle).
5	Covers circumstances when only a roof inspection is required.
6	For assets requiring architectural survey only, including 0.01 Foundations and Footings, 0.02 Substructure, 0.03 Superstructure, 0.04 Exterior Closure, 0.05 Roofing, and 0.06 Interior Finishes and Construction, and 0.11 Specialty Systems.
7	For assets requiring mechanical survey only, including 0.07 Conveying, and 0.08 Mechanical.
8	For assets requiring electrical survey only, 0.09 Electrical.
9	General site survey system 0.12 Site Systems only.
10	This factor allows sites to build their own inspection. These will be reviewed by Headquarters for possible addition to the ADF Guidelines.

ASSET DETERMINANT **FACTOR/CAS** REPAIR CODES/CAS COST FACTORS

CAS REPAIR CODES



Refer to the following page for definitions of the three (3) major CAS Repair Codes.

ASSET DETERMINANT FACTOR/CAS REPAIR CODES/CAS COST FACTORS

CAS REPAIR CODES

One of the key aspects of the assessment process, once significant deficiencies are recorded, is determining the repair category. CAS defines three major repair codes: condition, purpose, and urgency. Condition is derived both by the CAIS algorithm based on raw deficiency data and by the inspector's subjective judgment. Purpose and urgency are each selected by the inspector. Definitions for each major code are listed as follows:

(CAS **Repair** Codes are guidelines only. Codes may vary as required by sites.)

CONDITION CODE	DEFINITION
A	Excellent: Performs to original specifications as measured using non-standard tests; easily restorable to "like new" condition; only minimal routine maintenance required at cost <2% of replacement value.
B	Good: Performs to original specifications as measured using historical data and non-standard tests; routine maintenance or minor repair required at cost <5% of replacement value.
C	**Adequate:** Performance meets requirements; some corrective repair and/or preventive maintenance required at cost <10% of replacement value.
D	Fair: Performance fails to meet code or functional requirement in some cases; failure(s) are inconvenient; extensive corrective maintenance and repair required at cost <25% of replacement value.
E	Poor: Consistent substandard performance; failures are disruptive and costly; fails most code and functional requirements; requires constant attention, renovation, or replacement. Major corrective repair or overhaul required at cost <60% of replacement value.
F	Fall: Non-operational or significantly substandard performance. Replacement required because repair cost is >60% of replacement cost.

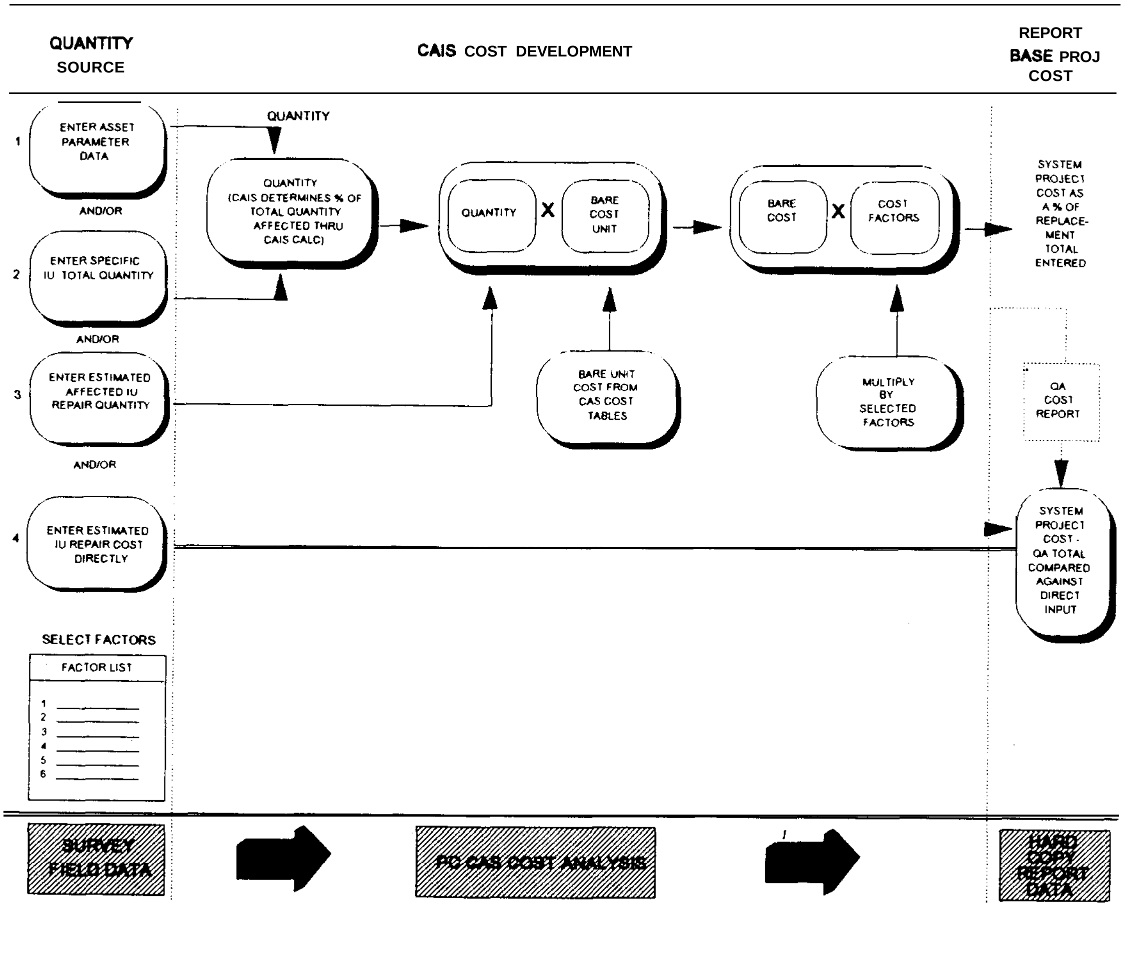
PURPOSE CODE*	DEFINITION
P2	PRG: Capacity
H2	H&S: Industrial Safetv
E2	ENV: Solid Waste Management
s 4	S&S: Security
*	Partial list based on CAMP Order DOE 4330.4A dated 1 O-l 7-90.

URGENCY CODE	DEFINITION
1	Repair Immediately: Asset condition critical; initiate corrective action immediately.
2	Repair within 1 Year: Asset condition serious; initiate corrective action within 1 year.
3	Repair in 1 to 2 Years: Asset condition degraded; initiate repair in 1 - 2 years.
4	Repair in 3 to 5 Years: Asset stable for period; integrate repairs into appropriate schedules.
5	No Repairs Necessary: Continue life cycle maintenance actions.

ASSET DETERMINANT **FACTOR/CAS** REPAIR **CODES/CAS** COST FACTORS

The following illustrates the cost development process for the Department of Energy CAS/CAIS Project and the various processes involved.

COST DEVELOPMENT PROCESS



END OF SUBSECTION

GUIDE SHEET TOOL & MATERIAL LISTING

SAFETY REQUIREMENTS

Inspections shall comply with all Federal, State, and Local regulations and all applicable safety and health regulations or requirements (including reporting requirements) of DOE.

TOOLS

This subsection contains tool and material listings for use in standard and non-standard inspections for 0.06 Interior Finishes & Construction in addition to the Basic Tool Group outlined below.

Accomplishing the activities identified in the inspection guides requires tools: basic, craft (standard), and specialized (non-standard). Specialized tools included in the non-standard tool group consist of special instruments and unique tools identified in the guides.

All crafts involved in the inspection of Interior Finishes & Construction assemblies and components should employ a standard or basic tool set. This basic tool set may vary somewhat between equally qualified personnel; however, the following is a representative set of common basic tools.

BASIC TOOL GROUP

- Flashlight
- Measuring Tape
- Mirror
- Pocket Knife
- Rags

STANDARD TOOL GROUP

- 12 foot measuring tape
- 3/8 inch drive socket set and ratchet
- 3x5 card stock for indicating photograph locations
- Aerosol can of bright colored Paint for marking deficiency locations
- Assorted center punches, drift punches, steel chisel
- Ball peen hammer
- Camera
- Claw hammer
- Crescent wrenches 4 and 8 inch
- Emery cloth
- Extension cords and inspection lights
- File
- Grease guns and oilers
- Hack saw and spare blades
- Level - 4 foot
- Metal square
- Open and box end wrenches 1/4 and 3/8 inch
- Permanent black marker
- Pipe wrenches to 14 inches
- Pliers - vise grip (2), slip joint, needle-nose, diagonal, cutting pliers, side cutters
- Small crowbar
- Small set of Allen wrenches
- Standard and phillips head screwdrivers - various sizes
- Stiff bristle brush
- Torpedo level
- Various cleaning tools - brushes, scrapers, etc.
- Wire brush

NON-STANDARD TOOL GROUP

- Acoustical emission analyzer
- Borescope or fiberscope
- Core driller
- Eddy current (electrical resistance) measuring device
- Infrared measuring device
- Magnetic scanning device
- Microwave absorption scanning device
- Moisture detection devices
- Nuclear analysis mechanism
- Ultrasonic measuring device
- Video camera
- X-Ray or radiography testing device

GUIDE SHEET TOOL & MATERIAL LISTING

TOOLS (Continued)

The basic tool set may be augmented to accomplish inspection actions on a specific assembly or component. The Guide Sheets identify this augmentation. Test methods for Interior Finishes and Construction systems are defined in subsection 1.3.

END OF SUBSECTION

NOTE: It is not the intent of this manual to have sites perform non-standard tests. These guidelines may be used in the event that standard inspection is not sufficient to determine system condition. Such non-standard inspections will be provided by others (e.g., consultants, outside labs).

TESTING METHODS

GENERAL

During the course of the Condition Assessment Survey, various tests will be employed to better ascertain the condition of the assets. These are indicated on the Component-Specific Guide Sheets included in Section 3 of this Manual. Testing will not be required on all assets. Where indicated, results of testing will be recorded in the Data Collection Method.

The critical nature of concrete, masonry, metal, or wood and its overall condition cannot be understated. Concrete, masonry, metal, or wood compressive strength is vital to maintain structural integrity. Where direct characteristics can be observed, surface deficiencies such as cracks, spalling, and exposed reinforcing may indicate hidden problems. In this case, underlying deterioration can be determined by further test measures. Testing materials in-situ seeks to gauge current conditions including position and size of any reinforcement, poor consolidation areas, voids, cracks, honey-combing, material integrity, degree of rot or decomposition, and moisture content to quantify current strength, durability, and elastic parameters as they exist in view of observed physical deficiencies.

Testing methods do not specify the following:

- Expertise of user (to use the instrument or interpret results).
- The advantage of one testing method versus another.
- The limitations of the testing method.
- Whether the user must be trained and licensed to operate (such as the Nuclear Moisture Meter Test, which requires licensing).

Variability

Estimation of in-situ concrete strength by the following test methods may provide site readings that vary from lab test calibrations between 2 to 10 percent. Pulse velocity tests are the most accurate with a site and lab calibration difference of approximately 2 percent. Other methods will generally range from 6 to 10 percent between site and lab conditions.

Standard vs. Non-Standard

Inspection Methods are classified as standard versus non-standard based on techniques employed.

Standard methods are generally quick, visual, hands-off walk-throughs not requiring a component to be taken out of service. Few tests are required in the associated Guide Sheets. Where tests are indicated, they are non-invasive. An example is Stress Monitor Analysis.

The Non-Standard Methods are generally those that require specialized equipment and analysis as well as destructive testing. Examples include Infrared, Nuclear Analysis, Core Sampling, Ultrasonic Pulse Velocity Testing, Surface Hardness Testing, etc.

Some of the tests could be conducted as part of either type inspection. For discussion purposes, they will be classified according to their specialized equipment and analysis; i.e., if a test can be conducted without specialized services, it will be listed under Standard Test Methods.

TESTING METHODS

STANDARD TEST METHODS

- Stress Monitor Analysis

STANDARD TEST DESCRIPTION

Stress Monitor Analysis

Stress analysis consists of documenting the location, pattern, depth and width, presence of foreign materials, and elevation differences between two cracked concrete or masonry masses and other horizontal or vertical surfaces. Determine if crack is active or dormant by following the steps:

- Mark the end of the crack and check after a few days to see if it has extended past the mark. Note direction.
- Place a notched piece of tape across the crack. Wait for a period of a month of more. If tape tears or compresses (wrinkles) the crack is active, and if the tape shows no apparent change the crack is dormant.
- Apply pins and gauge points on either side of crack. Measure distance between points at regular intervals with vernier calipers to determine the extent of movement.

NON-STANDARD TEST METHODS

- Acoustic Emission Testing
- Borescope or Fiberscope
- Core Sampling
- Electrical Resistivity Testing
- Infrared Testing
- Magnetic Testing
- Maturity Concept Analysis
- Microwave Absorption Scanning
- Nuclear Analysis
- Pick Test
- Radiography (X-Ray Testing)
- Surface Hardness Testing
- Ultrasonic Pulse Velocity Testing

NON-STANDARD TEST DESCRIPTION

Acoustic Emission Testing

Acoustic emission testing measures the acoustic or stress emissions from cracks or surfaces under strain. The stresses are detected as small displacements by sensors positioned on the surface. This type of testing has been used in recent years, however, its major drawback is that it can only be used during periods of high stress and deformations and does not work for static loading conditions.

Core Sampling

Core sampling involves taking core samples at various controlled sections to ascertain by laboratory mechanical/chemical analysis, the condition or strength of the material. Sample holes must be patched immediately.

Borescope or Fiberscope

Involves the use of instruments to view into materials, primarily masonry, to visually locate deficiencies such as cracks, spalls, or material deterioration. Use of these instruments involves drilling or creating holes in the sample material which requires patching upon completion.

Source: School and College - 'A **Systematic** Approach to **Roofing.**" October 1989, Mary E. **Skelly,** Author.

TESTING METHODS

NON-STANDARD TEST DESCRIPTION (Continued)

Electrical **Resistivity** Testing

Electrical resistivity testing involves passing electrical currents through the material to determine the resistance offered. This test is used to determine reinforcement corrosion and thickness of concrete pavements. This method of testing may also determine the moisture content or moisture penetration of concrete surfaces and degree of decay in wood members. Even though this is a relatively simple test method, it is highly dependent on moisture and salt content and the temperature of the material.

Infrared Testing

Infrared testing measures heat loss or gain. Those areas of the superstructure which absorb water will not insulate. Heat is lost more rapidly through these water absorbing areas, therefore, higher temperatures are detected with an infrared scanner. Cracks, voids and other discontinuities in the surface all affect heat emissions. Therefore, scanners can show the difference between sound and unsound surfaces. Infrared is done by scanning the surface with a hand-held instrument. This is still a method which requires further research and development.

Magnetic Testing

Magnetic testing involves scanning concrete surfaces with a U-shaped magnetic core with two coils in which an alternating current is passed through one coil and the current measured in the second. This test is used to measure the depth and detect position of reinforcement in concrete. It should be noted, however, that temperatures below freezing and heavily reinforced sections adversely affect the performance and results.

Maturity Concept Analysis

The maturity concept used in measuring in-situ concrete is based on the fact that concrete strength varies as a function of both time and temperature. These conditions are measured by thermocouples and/or instruments.

Microwave Absorption Scanning

Microwaves are electromagnetic in nature, therefore, they can be reflected, diffracted and absorbed. Absorption of the waves by water allows for the determination of moisture content of the material. This is relatively new and unproven, while the technique based on the reflection of electromagnetic waves has been used successfully. Although this method is fast and easy to perform, planning and skill is required to interpret and evaluate the results.

Nuclear Analysis

Nuclear analysis is accomplished using a mechanism that scatters neutrons on the surface being tested. Where water is present, radiation or neutron energy is taken back into the unit. The surface is squared off in a grid pattern and readings are taken from various points. Another method (relatively new and underdeveloped) involves bombarding the concrete surface with neutrons, which causes the surface materials to become radioactive. A comparative analysis is performed as the radioisotopes decay to a stable state.

Source: School and College - "A Systematic Approach to Roofing." October 1989, Mary E. **Skelly,** Author.

TESTING METHODS

NON-STANDARD TEST DESCRIPTION (Continued)

Pick Test

Pick testing consists of inserting any pointed tool into the surface of wood to lift a sliver. If the wood slivers, a sharp break indicates it is sound wood, a brash break suggests decay. A similar test is striking the wood surface with a hammer. A sharp ring usually indicates sound wood with a dull or hollow sound indicating decay or rot. This is not a very reliable test so if decay is suspected additional testing should be performed.

Radiography (X-Ray) Testing

Radiography testing involves passing radiation in the form of X-rays through an object to expose photographic film on the opposite side to detect cracking, voids or position of reinforcing. Seldom used for these building systems due to the cost and dangerous equipment required: Testing with gamma rays on the other hand is relatively portable and easier to use. The only limiting factor appears to be high cost and safety concerns.

Surface Hardness Testing

This test consists of impacting the concrete or masonry surface using standard devices to gauge with given energy pulse and measuring the size of rebound. A rebound hammer is the most commonly used method. problems and limitations of this test are affected by concrete surface smoothness carbonation, moisture condition as well as size, age and aggregate type.

Ultrasonic Pulse Velocity Testing

Ultrasonic testing is done by passing ultra-high frequency sound waves through a material. An oscilloscope, chart recorder or computer printout then records or displays the sound waves converted into electrical signals which were deflected off the rear surfaces or any defects within the material.

The basic concept used in the Ultrasonic Pulse Velocity Test consists of generating an ultrasonic wave through the concrete, masonry, or wood and measuring the travel time. This technique is excellent for establishing existing concrete, masonry, or wood uniformity and strength. It should be noted, however, concrete conditions such as age, moisture, aggregate to cement ratio, aggregate type, and steel reinforcement placement location may adversely influence test results.

Source: School and College • 'A Systematic Approach to Roofing." October 1989, Mary E. **Skelly,** Author.

END OF SUBSECTION

INSPECTION FREQUENCY

CAS INSPECTION SCHEDULE

The following constitutes recommended inspection frequencies for the listed assemblies and components. The purpose of these inspections is to support the Condition Assessment Survey (CAS) and are not necessarily for maintenance purposes. Each site has the option of varying the inspection frequencies to meet individual site requirements.

The recommended base CAS inspection frequencies are listed below in TABLE ONE for the system described in this manual. The base CAS constitutes standard inspections only and utilizes the standard guide sheets as a reference. All non-standard inspections are optional for Interior Finishes and Construction system assemblies and components.

TABLE ONE

Assembly/Component	Year One	Year Two	Year Three	Year Five
Partitions Conventional Concrete/Masonry			S	
Structural, Facing Tile		S		
Drywall/Plaster	S			
Partitions Specialty	S			
Toilet Partitions & Accessories	S			
Interior Doors	S			
Paint Finishes/Coatings Conventional Paints	S			
Special Coatings	S			
Finishes	S			
Wall Covering Systems Coverings	S			
Paneling	S			
Ceramic Tile	S			
Quarry Tile	S			
Floor Finishing Systems Carpet	S			
Composition/Resilient Flooring	S			
Floor (Concrete)		S		
Terrazzo		S		
Cork Tile	S			
Tile	S			
Wood Flooring	S			
Ceiling Systems Drywall/Plaster	S			
Acoustical (Including Grid)	S			
Wood	S			
Concrete			S	
Metal	S			

S - STANDARD INSPECTIONS — NS - NON-STANDARD INSPECTIONS

NOTES: 1. Severe weather or facility operational conditions may require additional inspections.
2. Non-Standard inspections will be provided on an 'as required" basis unless noted otherwise.

INSPECTION FREQUENCY

END OF SUBSECTION

STANDARD SYSTEM DESIGN LIFE TABLES

GENERAL

The Standard (nominal) Design Life of a given System Assembly/Component is defined as the projected service design life measured from the date of installation to the date of replacement. These time periods are based on manufacturers' product specifications and tests which determine the average "outside" time parameter a given System Assembly/Component will last. The Standard Design Life Tables that follow lists design life and replacement cost parameters for WBS. TABLE ONE below illustrates key column headings.

TABLE ONE

ITEM DESCRIPTION	Replacement Life. **Years***	Percent Replaced
Note 1:	Used to document the replacement life* of significant WBS System Assembly/Components.	
Note 2:		Used to estimate percent of WBS System Assembly/Component cost replaced at the year specified (measured from installation date to end date specified by the replacement life period*).

*Note The term Replacement Life is synonymous with Design Life.

STANDARD SYSTEM DESIGN LIFE TABLES

ITEM DESCRIPTION	Replacement Life. Years	Percent Replaced
0.06 INTERIOR FINISHES & CONSTRUCTION		
Brick partitions, exposed	75	100
Concrete block partitions lightweight, exposed	60	100
Structural clay facing tile partitions, exposed	60	100
Drywall partitions, metal or wood studs	25	100
Lath and plaster partitions, metal or wood studs	35	100
Glazed partitions, bank-height metal or wood framing	30	100
Baked enamel steel partitions, demountable, full or bank height	25	100
Vinyl-covered steel partitions, demountable. full or bank height	25	100
Gypsum plain-finish partitions, movable, full or bank height	20	100
Gypsum prefinished painted partitions, movable, full or bank height	20	100
Gypsum vinyl-covered partitions movable, full or bank height	20	100
Gypsum plastic-laminated partitions, movable, full or bank	20	100
Steel-lined vinyl folding partitions, manual	20	100
Vinyl clad steel folding partitions, manual	25	100
Aluminum-faced folding partitions, manual	20	100
Enameled-steel folding partitions, manual	25	100
Hardwood veneer folding partitions, manual	25	100
Plastic-laminated foldina partitions. manual	25	100
Metal baked-enamel toilet partition: frame, door, and hardware	25	100
Laminated-plastic toilet partition: frame, door, and hardware	25	100
Stainless steel toilet partition: frame, door, and hardware	35	100
Porcelain enamel toilet partition: frame, door, and hardware	25	100
Painted plywood toilet partition: frame, door, and hardware	20	100
Marble toilet partition: frame, door, and hardware	75	100

STANDARD SYSTEM DESIGN LIFE TABLES

ITEM DESCRIPTION	Replacement Life, Years	Percent Replaced
0.06 INTERIOR FINISHES & CONSTRUCTION (Continued) BALUSTRADES		
Steel railing and handrail, pipe or bar	30	100
Aluminum railing and handrail	40	100
Stainless steel railing and handrail	50	100
Bronze railing and handrail	50	100
Wood railing and handrail	25	100
SCREENS Wood screen	25	100
Concrete block	40	100
Hollow metal door and frame, hardware	30	100
Hollow-core wood door with metal frame, hardware	20	100
Solid-core wood door with metal frame, hardware	30	100
Hollow core wood door with wood frame, hardware	20	100
Solid-core wood door with wood frame, hardware	30	100
Special (security) metal door	40	100
Plastic laminate wood door	25	100
Interior paint on masonry	N/A	N/A
Interior paint on masonry	N/A	N/A
Interior paint on plaster	N/A	N/A
Interior paint on drywall	N/A	N/A
Wall paper, light to medium weight	N/A	N/A
Vinyl, light to medium weight	12	100
Ceramic tile, glazed with organic adhesive	25	100
Ceramic mosaics, unglazed with organic adhesive	25	100
Stone veneer	75	100
Wood veneer, stain, or varnish	40	100
Oak parquet and block flooring, solid	35	100
Maple gym flooring	35	100
Resilient asphalt tile, 1/8 inch thick	15	100
Resilient vinyl tile, 1/8 inch thick	20	100
Vinyl asbestos tile, 1/8 inch thick	18	100
Carpeting, standard acrylic or nylon	12	100
Ceramic tile, glazed with trim, organic	25	100
Ceramic mosaics, unglazed with organic adhesive	25	100
Quarry tile with 3/4 inch portland cement bed	30	100
Terrazzo, 2 1/2 - 3 inches thick	50	100

STANDARD SYSTEM DESIGN LIFE TABLES

ITEM DESCRIPTION	Replacement Life, Years	Percent Replaced
0.06 INTERIOR FINISHES & CONSTRUCTION (Continued)		
Brick, unglazed pavers	35	100
Raised access floor--plastic laminate 30 x 30 inch panels	25	100
Raised access floor--carpeted 24 x 24 inch panels	10	20
Raised access floor--carpeted 30 x 30 inch panels	10	20
Acoustical tile, concealed zee splines	10	100
Acoustical tile, exposed 2x4 foot grid with hangers	10	100
Acoustical tile, mineral fiber, 12x12 inches	12	100
Acoustical tile, mineral fiber lay-in panels with painted face, 24 x 24 inches	15	100
Acoustical tile, exposed 2 x 2 foot grid with hangers	10	100
Gypsum board, painted	N/A	NIA

END OF SUBSECTION

SYSTEM WORK BREAKDOWN STRUCTURE

GENERAL

Facilities are composed of various assemblies/components which, in turn, form the primary facility systems. These systems, such as foundations, roofs, heating and cooling units, and electrical distribution, have varying life spans. They require maintenance, repair, and renovation over a period of time and do not all “fail” at the same time. Systems have varying life spans. Their condition may be influenced by the deterioration of other assembly/component parts within the systems.

To consider each facility and their major systems, the CAS Program uses the Work Breakdown Structure (WBS) based on the R.S. Means square foot costing system. This industry accepted standard allows a logical “breakdown” of facilities into their major systems, assemblies, components, etc. The WBS is a heirarchical structure; this concept is illustrated in Figure 1. The development of project costs are then applied within this framework as shown in Figure 2.

The Work Breakdown Structure for this volume follows.

SYSTEM WORK BREAKDOWN STRUCTURE

0.06 SYSTEM - INTERIOR FINISHES & CONSTRUCTION

0.06.01	PARTITIONS CONVENTIONAL
0.06.01 .01	Concrete/Masonry
0.06.01.02	Structural, Facing Tile
0.06.01.03	Drywall/Plaster
0.06.02	PARTITIONS SPECIALTY
0.06.03	TOILET PARTITIONS &ACCESSORIES
0.06.04	INTERIOR DOORS
0.06.05	PAINT FINISHES/COATINGS
0.06.05.01	Conventional Paints
0.06.05.02	Special Coatings
0.06.05.03	Finishes
0.06.06	WALL COVERING SYSTEMS
0.06.06.01	Coverings
0.06.06.02	Paneling
0.06.06.03	Tile
0.06.07	FLOOR FINISHING SYSTEMS
0.06.07.01	Carpet
0.06.07.02	Composition/Resilient Flooring
0.06.07.03	Floor (Concrete)
0.06.07.04	Terrazzo
0.06.07.05	Cork Tile
0.06.07.06	Tile
0.06.07.07	Wood Flooring
0.06.08	CEILING SYSTEMS
0.06.08.01	Drywall/Plaster
0.06.08.02	Acoustical (Including Grid)
0.06.08.03	Wood
0.06.08.04	Concrete
0.06.08.05	Metal

SYSTEM WORK BREAKDOWN STRUCTURE

WBS LEVEL TABLE

0.06	LEVEL I	0.08
ROOFING	SYSTEM	MECHANICAL
0.05.01	LEVEL2	0.08.01
BUILT-UP	ASSEMBLY	PLUMBING
0.05.01.01	LEVEL 3	0.08.01.01
MEMBRANE	COMPONENT	DOM. WATER
0.05.01.01.01	LEVEL 4	0.08.01.01.01
3-PLY ASPHALT	SUBCOMPONENT/ TYPE	PIPE
0.05.01.01.01.01	LEVEL5	0.08.01.01.01.01
NOT USED	TYPE	3/4" DIA. COPPER

WBS ORGANIZATION HIERARCHY

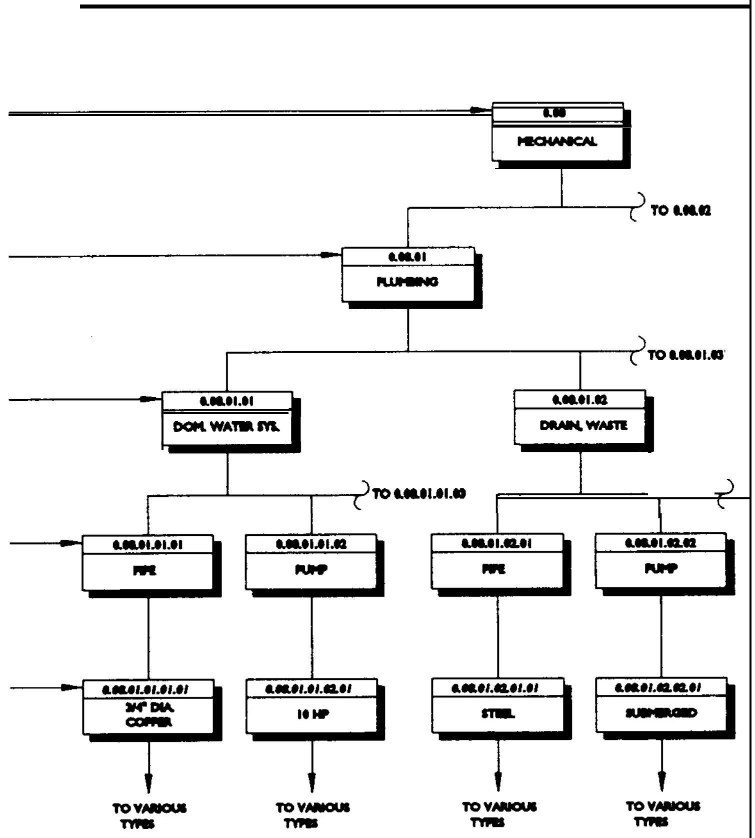


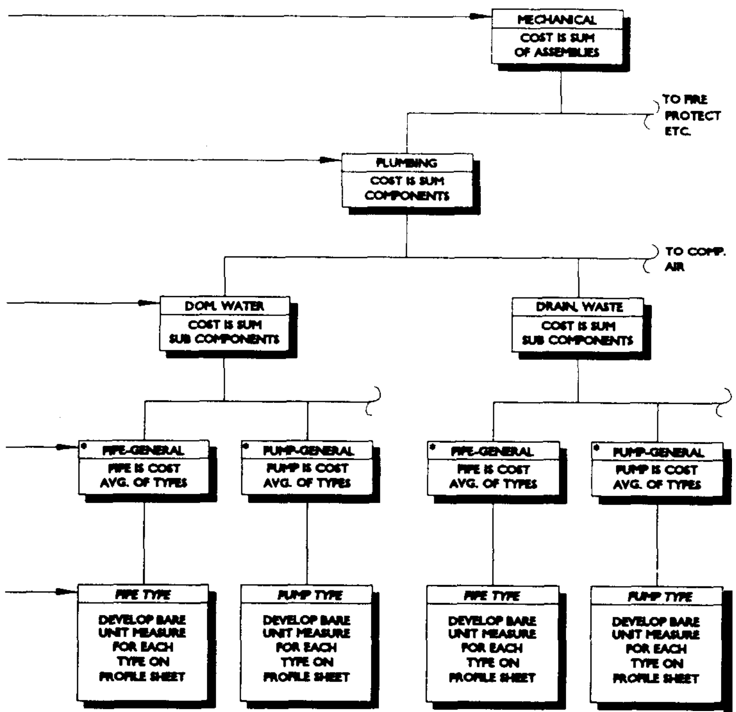
FIG. I

SYSTEM WORK BREAKDOWN STRUCTURE

WBS LEVEL TABLE

0.05	LEVEL 1	0.08
ROOFING	SYSTEM	MECHANICAL
0.05.01	LEVEL 2	0.08.01
BUILT-UP	ASSEMBLY	PLUMBING
0.05.01.01	LEVEL 3	0.08.01.01
MEMBRANE	COMPONENT	DOM. WATER
0.05.01.01.01	LEVEL 4	0.08.01.01.01
3-PLY ASPHALT	SUBCOMPONENT/ TYPE	PIPE
0.05.01.01.01.01	LEVEL5	0.08.01.01.01.01
NOT USED	TYPE	3/4" DIA. COPPER

WBS COST DEVELOPMENT HIERARCHY



* NOTE: IF COMPONENT/SUBCOMPONENT TYPE NOT KNOWN OR COMPONENT TYPE DATA NOT COMPILED, USE GENERAL COMPONENT PRICING.

FIG. 2

END OF SUBSECTION

GENERAL SYSTEM/MATERIAL DATA

INTRODUCTION

With the increasing cost of new construction and equipment, it is becoming more of a necessity to ensure that existing buildings and systems are maintained at regular intervals and repairs are made to last over the long term. This section is composed of several tables consisting of Concrete Deterioration, Deterioration of Structural Steel, Imperfections in Wood, Causes of Timber Deterioration, Preservations, Effects of Chemicals on Concrete, and Common Paint Finishes/Coatings irregularities.

The purpose of this section is to give a general description of damages, diagnosis, and causes of deterioration of building materials such as concrete, structural steel, wood, and paint finishes/coatings. This is oriented toward locating defects and potential material failure problems prior to major damage or complete failure of systems/components. Recognizing Interior Finishes & Construction defects and their effects on the building and its occupants and contents are stressed. Special attention should be given to the causes and correction or repair of common defects. Data herein should be used in conjunction with the specific System/Assembly data that follows this general section.

GENERAL SYSTEM/MATERIAL DATA

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GENERAL SYSTEM/MATERIAL DATA

COMMON CAUSES OF CONCRETE DETERIORATION

(Similar for **Pre-Cast Concrete)**

Damage	**Diagnosis**	**Cause**
Alkali-Aggregate Expansion	Slight cracking to complete breakup	Chemical reaction between aggregate and cement paste.
Cavitation	Spalling around projections. Honey-combing. Popping and cracking noises when water moves over the surface.	Rapid movement of water or other liquids across the surface.
Cracks (Active and Dormant)	Random, isolated or patterned cracks	Construction movement, settlement, shrinkage around reinforcement. Setting shrinkage due to inadequate finishing and curing.
Before hardening of the concrete:	Patterned cracking, protruding aggregate, popouts. Chemical analysis indicates deterioration of cement paste.	Chemical reactions, such as corrosion.
After hardening of the concrete:	Surface cracking, patterned.	Physical, such as drying shrinkage
	Extreme change in measured temperatures between inner and outer surfaces. Shallow cracking.	Thermal changes (subjected to temperature extremes, such as from freezing and thawing cycles).
	Localized cracking.	Stress concentration.
	Cracks, usually isolated.	Structural design.
	Cracks can be isolated or patterned depending on crack-producing agent.	Accidents from overload, vibration, fatigue and earthquake.
Corrosion of Reinforcing Steel	Cracks will occur at the level of the reinforcement and parallel to it. Rusting or discoloration will be evident.	Insufficient cover of steel. Quality of concrete. Over-use of calcium chloride as admixture.
Crazing	Shallow cracks forming a hexagonal pattern.	Surface shrinkage more rapid than interior of concrete to the surface and depositing salts.
Dusting	Appearance of a powdery substance on the surface of the concrete.	Too wet of a concrete mixture. Premature or excessive working of the surface. Organic materials in the aggregate. Inadequate curing.
Efflorescence	Appearance of crystalline salts on the concrete surface.	Water migrating from the interior mass of the concrete to the surface and depositing salts.
Fire	Charred and spalled surfaces.	Fire.
Form Scabbing	Difficult to remove forms. Uneven, spalled areas.	Form oil improperly applied.
Holes (Small and Large)	Popouts, holes, random pattern or isolated in extreme.	Chemical reaction. Inadequate construction and desian.
Honeycombing	Surface defects-voids. Coarse aggregate broken away from the surface.	Placing concrete aggregate with insufficient type of mortar. Improper placing techniques, such as inadequate vibration.

Source: Means Facilities Maintenance Standards . "R.S. Means Co., Inc., Kingston, Massachusetts"

GENERAL SYSTEM/MATERIAL DATA

COMMON CAUSES OF **CONCRETE** DETERIORATION
(Similar for **Pre-Cast** Concrete)

Damage	Diagnosis	Cause
Popouts	Breaking away of a particle near the surface. Excessive amount of moisture or temperature changes in the region.	Depressions left by material popping out. Presence of disintegrated material near the popout.
Sand Streaking	Vertical streaks of sand which appear on the surface, most noticeable when forms are immediately stripped.	Concrete mixed with a high water content or a deficiency of finer sand sizes are placed in a formwork that is not water-tight.
Scaling	Flaking or peeling away of thin layers of concrete.	Severe freeze/thaw conditions. Improper use of deicing salts. Repeated wetting and drying of concrete. Improper finishing. Chemical attack of concrete. Heat blast,
Spalling	Fragments of concrete that have been broken from the surface. Corrosion of reinforcement.	Corrosion of reinforcement. Mechanical damage. Incorrect form removal. Shock-waves.
Stain and Uneven Color	Discoloration or lacking uniformity in appearance.	Chemical action of foreign materials on the surface. Mixing of different types of cement with each other. Reaction of materials comprising the concrete mixture.

A SUMMARY OF THE TYPES & CAUSES OF **DETERIORATION** OF STRUCTURAL STEEL

Type of Deterioration	**Cause**
Abrasion	Members subjected to contact with moving parts. Members subjected to wave action. Members immersed in a moving liquid. Worn, smooth appearance, general depression of the abraded area.
Corrosion	Resulting from a chemical or electrochemical reaction which converts the metal into an oxide, carbonate and sulfides. Pitted, oxidized surface showing loose flakes, reddish-brown rust colored appearance.
Fatigue	Repetitive, cyclic loading occurring at stresses at or below allowable design values. Small fractures oriented perpendicular to the line of stress.
Impact	Local distortion of the member in the form of a sharp crimp. Will occur in a tension member of flange.
Lamellar Tearing	Minute, often times unseen cracking in the weldment. May need microscopic instruments to observe. Incorrect welding process,
Loosening of Connections	Impact and fatigue loading. Vibrations and improper tightness.

Source: Means Facilities Maintenance Standards • "**R.S. Means** Co., Inc., Kingston, **Massachusetts**"

GENERAL SYSTEM/MATERIAL DATA

COMMON IMPERFECTIONS IN WOOD

Imperfection	Description	Effects on Strength	Effect on Grading Structural Lumber
Checks and Splits	Split in the wood.	In lumber subjected to bending, checks and splits reduce the resistance to shear; they do not affect the strength for longitudinal compression.	Checks and splits are restricted in those parts of a bending member where shearing stresses are highest.
Holes	Either a knothole or a hole caused by some other means.	Reduces tensile strength somewhat more than compressive and shear strength and affect stiffness.	The size, number and location of knots is restricted for structural lumber; cluster knots are prohibited.
Knots	Localized imperfections,	Same as for holes.	Same as for holes.
Pitch Pockets	Opening between growth rings containing pitch or bark.	Little or no effect.	Usually disregarded except if a large number occur; shake may be present or bond between annual growth rings may be weakened.
Shakes	A separation of the wood between the annual growth rings,	Same as for checks and splits.	Same as for checks and splits.
Slope of Grain	Areas where the direction of the wood grain is not parallel to the edges of the piece of lumber.	Will twist with changes in moisture content.	Cross-grained pieces are undesirable; reduction of strength due to cross grain in structure is taken as twice the reduction observed in tests of small clear specimens.
Wane	Bark or lack of wood on the edge or corner of the piece of lumber.	Affects nailing and bearing.	Limited in structural lumber requirements for fabrication, bearing, nailing and appearance and not for effect on strength.

SUMMARY OF CAUSES OF TIMBER DETERIORATION WITH SYMPTOMS

Cause of Deterioration	Symptoms
Carpenter Ants, Beetles & Carpenter Bees	Similar to termites.
Termites	Bore holes; lacing/cavitation of wood; connecter tunnels from grade to wood source (usually mud). Premature wood bowing and failure.
Decay (Rot) Due to Fungi	Softening and discoloration of wood, fluffy or cottony appearance, destruction of wood cells, appearance of fruity bodies in the form of mushrooms, incrustations in the advanced stage.
Excessive Splitting and Checking	Excessive relative amount of members at a joint, bowing of compression members (shown by broken paint lines or newly exposed wood), elongated bolt holes,
Fire Damage	Surface cellular damaqe, charred surfaces, easily probed with a knife.
Hardware	Loose connections, formation of rust on hardware surfaces, discoloration of wood adjacent to hardware.
Loosened Connections	Loose connections, excessive deflection
Marine Borers	Minute openings in the timber, hollow sound when struck with a hammer, a myriad of surface grooves, narrowing of a section giving it an hourglass appearance.

Source: **Means Facilities Maintenance Standards** - ‘Rd. **Means** Co., Inc., **Kingston, Massachusetts"**

GENERAL SYSTEM/MATERIAL DATA

PRESERVATIVES — ADVANTAGES & DISADVANTAGES

Oil-Based Wood Preservatives

Type of **Preservative**	Advantages	Disadvantages
Anthracene Oils	High toxicity to wood-destroying organisms; insoluble in water; low volatility; ease of application; permanence.	Dark brown color, cannot be painted; strong, unpleasant odor; easily ignited when first applied.
Coal-Tar Creosotes	See Anthracene Oils.	See Anthracene Oils.
Copper Naphthenate	High protection against decay fungi and termites; can be painted; not unpleasant odor; less easily ignited than coal-tar creosotes	Gives wood greenish or dark color and provides less protection against marine borers than creosote.
Creosotes Derived From Wood. Oil and Water Gas	Same as Anthracene Oils and Coal-Tar Creosotes.	About the same as Anthracene Oils and Coal-Tar creosotes. but less effective.
Creosote Solutions	See Anthracene Oils and Coal-Tar Creosotes.	About the same as Anthracene Oils and Coal-Tar creosotes, but less effective.
Water-Repellent Preservatives	Retards moisture changes in wood; good protection against decay and insects.	Cannot be used in contact with ground or areas where continual dampness can occur unless preservative is thoroughly applied.

Water-Based Wood Preservatives

Acid Copper Chromate	Provides protection against decay and insects; can be painted; no objectionable odor; if thoroughly impregnated has some resistance to marine borers.	Wood can be used in contact with ground, but generally not recommended for contact with water.
Ammonical Copper Arsenite	Good protection against decay and insects and some protection against marine borers.	Wood can be used in contact with ground, but generally not recommended for contact with water.
Chromated Zinc Chloride	Provides protection against decay, insects and fire; can be painted; no objectionable odor.	Wood cannot be used in contact with ground or water.
Chromated Zinc Chloride (FR)	See Chromated Zinc Chloride.	See Chromated Zinc Chloride.
Copperized Chromated Zinc Chloride	See Chromated Zinc Chloride.	See Chromated Zinc Chloride.
Tanalith (Wolman Salts)	Protects against decay and insects; can be painted; no objectionable odor.	Wood cannot be used in contact with ground or water.
Zinc Meta Arsenite	Good protection against decay and insects; can be painted; no objectionable odor.	Wood can be used in contact with ground, but generally not recommended for contact with water.

Source: Mean8 **Facilities** Maintenance Standard8 - **"R.S.** Mean8 Co., Inc., **Kingston, Massachusetts"**

GENERAL SYSTEM/MATERIAL DATA

Acetic Acid, ail Concentrations	Disintegrates slowly.
Acetone	Liquid loss by penetration. May contain acetic acid as impurity.
Acid Waters	(pH of 6.5 or less) (a) Disintegrates slowly. In porous or cracked concrete, attacks steel.
Aluminum Chloride	Disintegrates rapidly. In porous or cracked concrete, attacks steel.
Ammonia Vapors	May disintegrate moist concrete slowly or attack steel in porous oı cracked moist concrete.
Ammonium Bisuifate	Disintegrates. In porous or cracked concrete, attacks steel.
Ammonium Carbonate	Not harmful.
Ammonium Cyanide	Disintegrates slowly.
Ammonium Fiuoride	Disintegrates slowly.
Ammonium Nitrate	Disintegrates. In porous or cracked concrete, attacks steel.
Ammonium Oxaiate	Not harmful.
Ammonium Sulfide	Disintegrates.
Ammonium Sulfite	Disintegrates.
Ammonium Superphosphate	Disintegrates. In porous or cracked concrete, attacks steel.
Ammonium Ihiosuifate	Disintegrates.
Ashes	Harmful if wet, when sulfides and sulfates leach out (see sodium sulfate).
Ashes, hot	Cause thermal expansion.
Automobile and Diesel Exhaust Gases (d)	May disintegrate moist concrete by action of carbonic, nitric, or sulfurous acid.
Benzol (Benzene)	Liquid loss by penetration.
Bromine	Gaseous bromine disintegrates. Liquid bromine disintegrates if it contains hydrobromic acid and moisture.
Butyi Stearate	Disintegrates slowly.
Calcium **Bisulfite**	Disintegrates rapidly.
Chlorine Gas	Slowly disintegrates moist concrete.
Chrome Plating Solutions (e)	Disintegrates slowly.
Chromic Acid, & Concentrations	Attacks steel in porous or cracked concrete.
Cinders	Harmful if wet, when sulfides and sulfates leach out (see, for example, sodium sulfate).
Coal	Sulfides leaching from damp coal may oxidize to sulfurous or sulfuric acid, or ferrous sulfate (see ferrous sulfate).
Coal Tar Oils	See anthracene, benzol, carbazole, chrysen, creosote, creosol, cumol, paraffin, phenanthrene, phenol, toluol, xylol.
Cobalt Sulfate	Disintegrates concrete of inadequate sulfate resistance.
Coke	Sulfides leaching from damp coke may oxidize to sulfurous or sulfuric acid.
Copper Chloride	Disintegrates slowly.
Copper Sulfate	Disintegrates concrete of inadequate sulfate resistance.
Copper Sulfide	Harmful if it contains copper sulfate.
Corrosive Sublimate	See mercuric chloride.
Creosote	Phenol present disintegrates slowly.
cresoi	Phenol present disintegrates slowly.
Cumol	Liquid loss by penetration.
Deicing Salts	Scaling of non-air-entrained or insufficiently aged concrete (b).
Diesel Gases	See automobile and diesel exhaust gases.
Ferric Chloride	Disintegrates slowly.
Ferric Sulfate	Disintegrates concrete of inadequate quality.
Ferric Sulfide	Harmful if it contains ferric Sulfate
Ferrous Chloride	Disintegrates slowly.
Ferrous Sulfate	Disintegrates concrete of inadequate sulfate resistance.

GENERAL SYSTEM/MATERIAL DATA

Flue Gases	Hot gases **(400-l 1 00°F)** causes **thermal stresses Cooled, condensed sulfurous, hydro-chloric** acids disintegrate slowly.
Gas Water (e)	Ammonium salts seldom present in sufficient quantity to disintegrate.
Gasoline	Liquid loss by penetration.
Hydrofluoric Acid, all Concentrations	Disintegrates rapidly, including steel.
Hydrogen Sulfide	Not harmful dry. In moist, oxidizing environments converts to sulfurous acid and disintegrates slowly.
Hypochlorous Acid, 10 percent	Disintegrates slowly.
Iodine	Disintegrates slowly.
Kerosene	Liquid loss by penetration of concrete.
Lead Nitrate	Disintegrates slowly.
Lead Refining Solutions **(f)**	Disintegrates slowly.
Lignite Oils	If fatty oils are present, disintegrates slowly.
Locomotive Gases	May disintegrate moist concrete by action of carbonic, nitric or sulfurous acids (see also automobile and diesel exhaust gases).
Lubricating Oil	Fatty oils, if present, disintegrate slowly.
Machine Oil	Fatty oils, if present, disintegrate slowly.
Magneslum Nitrate	Disintegrates slowly.
Manganese Sulfate	Disintegrates concrete of inadequate sulfate resistance.
Mercuric Chloride	Disintegrates slowly.
Mercurous Chloride	Disintegrates slowly.
Methyl Alcohol	Liquid loss by penetration.
Methyl Ethyl Ketone	Liquid loss by penetration.
Methyl **Isobutyl** Ketone	Liquid loss by penetration.
Mine Water, Waste	Sulfides, sulfates, or acids present disintegrate concrete and attack steel in porous or cracked concrete.
Mineral Spirits	Liquid loss by penetration.
Muriatic Acid	See hydrochloric acid.
Nickel Plating Solutions	Nickel ammonium sulfate disintegrates slowly.
Nickel Sulfate	Disintegrates concrete of inadequate sulfate resistance.
Nitric Acid, all Concentrations	Disintegrates rapidly.
ores	Sulfides leaching from damp ores may oxidize to sulfuric acid or ferrous sulfate.
Oxalic Acid	Not harmful. Protects tanks against acetic acid, carbon dioxide, salt water. Poisonous. Do not use with food or drinking water.
Paraffin	Shallow penetration not harmful, but should not be used on highly porous surfaces like concrete masonry (g).
Perchloric Acid, 10 percent	Disintegrates.
Perchloro- Ethylene	Liquid loss by penetration,
petroleum Oils	Liquid loss by penetration, Fatty oils, if present, disintegrate slowly.
Phenanthrene	Liquid loss by penetration.
phenol, **5-25** percent	Disintegrates slowly.
Potassium Cyanide	Disintegrates slowly.
Potassium **Dichromate**	Disintegrates.
Potassium Hydroxide, 25 percent or over	Disintegrates concrete.
Potaulum Permanganate	Harmless unless potassium sulfate present.
Potassium Persulf ate	Disintegrates concrete of inadequate sulfate resistance.
Potassium Sulfate	Disintegrates concrete of inadequate sulfate resistance.

GENERAL SYSTEM/MATERIAL DATA

Potassium Sulfide	Harmless unless potassium sulfate present.
Pyrites	See ferric sulfide, copper sulfide.
Sal Soda	See sodium carbonate.
Salt for Deicing Roads	Also calcium chloride, magnesium chloride, sodium chloride.
Saltpeter	See potassium nitrate.
Sea Water	Disintegrates concrete of inadequate sulfate resistance. Attacks steel in porous or cracked concrete.
Sewage	Usually not harmful (see hydrogen sulfide).
Silage	Acetic, butyric, lactic acids (and sometimes fermenting agents of hydrochloric or sulfuric acids) disintegrate slowly.
Sodium Bisulfate	Disintegrates.
Sodium Bisulflte	Disintegrates.
Sodium Bromide	Disintegrates slowly.
Sodium Carbonate	Not harmful, except to calcium aluminate cement.
Sodium Chloride	Magnesium chloride, if present, attacks steel in porous or cracke concrete. (b) Steel corrosion ma cause concrete to spall.
Sodium Cyanide	Disintegrates slowly.
Sodium **Dichromate**	Dilute solutions disintegrate slowly.
Sodium Hypochlorite	Disintegrates slowly.
Sodium Nitrite	Disintegrates slowly.
Sodium phosphate (Monobasic)	Disintegrates slowly.
Sodium Sulfate	Disintegrates concrete of inadequate sulfate resistance.
Sodium Sulfide	Disintegrates slowly.
Sodium lhiosulfate	Slowly disintegrates concrete of inadequate sulfate resistance.
Strontium Chloride	Not harmful.
Sulfite **Liquor**	Disintegrates.
Sulfite Solutlon	See calcium bisulfate.
Sulfurous Acid	Disintegrates rapidly.
Toluol (Toluene)	Liquid loss by penetration.
lung Oil	Liquid disintegrates slowly. Dried or drying films are harmless.
Turpentine	Mild attack. Liquid loss by penetration.
Urine	Attacks steel in porous or cracked concrete.
Xylol (Xylene)	Liquid loss by penetration.
Zinc Nitrate	Not harmful.
Zinc Refining Solutions (i)	Hydrochloric or sulfuric acids, if present, disintegrate concrete.
Zinc Slag	Zinc sulfate sometimes formed by oxidation.
Zinc Sulfate	Disintegrates slowly.

GENERAL SYSTEM/MATERIAL DATA

SPECIAL NOTATIONS

a. Waters of pH higher than 6.5 may be aggressive, if they also contain bicarbonates. (Natural waters are usually of pH higher than 7.0 and seldom lower than 6.0 though pH values as low as 0.4 have been reported. For pH values below 3, protect as for dilute acid.)

b. Frequently used as a deicer for concrete pavements. If the concrete contains too little entrained air or has not been aged more than one month, repeated application may cause surface scaling. For protection under these conditions, see "deicing salts."

c. Water used for cleaning coal gas.

d. Composed mostly of nitrogen, oxygen, carbon dioxide, carbon monoxide, and water vapor. Also contains unburned hydrocarbons, partially burned hydrocarbons, oxides of nitrogen, and oxides of sulfur. Nitrogen dioxide and oxygen in sunlight may produce ozone, which reacts with some of the organics to produce formaldehyde, peracylnitrates, and other products.

e. These either contain chromium trioxide and a small amount of sulfate, or ammonium chromic sulfate (nearly saturated) and sodium sulfate.

f. Contains lead fluosilicates and fluosilicic acid.

g. Porous concrete which has absorbed considerable molten paraffin and then been immersed in water after the paraffin has solidified, has been known to disintegrate from sorptive forces.

h. Contains nickelous chloride, nickelous sulfate, boric acid, and ammonium ion.

i. Usually contains zinc sulfate in sulfuric acid. Sulfuric acid concentration may be low (about 6 percent in "low current density" process) or higher (about 22-28 percent in "high current density" process).

GENERAL SYSTEM/MATERIAL DATA

COMMON PAINT FINISHES/COATINGS IRREGULARITIES

Film Irregularities	Probable Cause	Correction
ALLIGATORING Cross-hatch pattern of surface cracking	1 Incompatibility of topcoat and underfilm, or coatrng over a soft underfrlm	1 Remove failed coatrng and recoat with compatible system suitable for exposure conditions Do not topcoat until underfrlm is dry enough to recoat
BUBBLING Bubbles on the surface of the dried film May be macroscopic in size	1. Rapid volatilization of sol-vents within the film	1 Level surface defects by sanding and reapply coating at lower air or surface temperature, or add slower solvent to Increase open time of wet film
	2. Air displacement resulting from absorption of wet film into porous substrate.	2a Bridge or fill voids by applying a mist coat, a filler or sealer. 2b Hose down concrete and masonry with water and allow to drain before applying water-thinned coat.
CRACKING Visible cracks through the surface of the film.	1. Stress or compression cracking or rigid substrate.	1. Patch cracks and recoat.
	2. Bending or flexing on non-rigid substrates.	2. Replace with coatrng having sufficient flexural strength to tolerate condition
	3. Physical damage: Impact, heat, cold, exposure, etc	3. Replace with coating that will tolerate physical conditions.
	4. Surface freezing of fresh latex coating	4. Recoat when air and surface temperatures are above minimum recommendations.
	5. Application of excessive number of coats.	5. Remove failed coating and recoat with appropriate system.

GENERAL SYSTEM/MATERIAL DATA

COMMON PAINT FINISHES/COATINGS IRREGULARITIES

Film Irregularities	Probable Cause	Correction
CRATERING Round-shaped thin spots or voids	1 Caused when bubbles break 2 Water in spray equipment lines	1 See "Bubbling" 2 Level defect by sanding Correct equipment malfunc-tion and flush lines before recoating
CRAZING Fine line cracking forming a network or overall pattern	1 See "Cracking"	1 See "Cracking"
DRY SPRAY Rough, sandy surface texture on spray applied coating	1. Spray particles partrally dry before reaching surface	1 Sand smooth and adjust material, equipment and technique for prevailing temperature and humidity conditions
FLATTING Loss of gloss	1. Rain, fog, high humidity, or damp surfaces. 2 Overthinning or use of wrong solvent.	1. Recoat when surface is dry and weat her conditions are satisfactory. 2. Remove coating if film properties or adhesion are affected and recoat with properly thinned material.
FRAMING Color texture or hiding variations where roller applied surfaces join work cut in with brush.	1. Uneven film build between roller and brush applied work.	1 Recoat deficient work, apply heavier wet film or additional coat on new work.
(POOR) HIDING Uneven color or shadowy appearance of topcoat.	1 Insufficient number of coats or low film build 2. Insufficient mixing	1 See "Framing" (Note. Some colors have weak hiding properties and requrre an additional coat for satis-factory hiding.) 2. Stir material thoroughly before use and keep in suspensron during appli-cation
HOLIDAYS Skipped or missed area		1. Touch-up or recoat.

GENERAL SYSTEM/MATERIAL DATA

COMMON PAINT FINISHES/COATINGS IRREGULARITIES

Film Irregularities	Probable Cause	Correction
LAPPING (Lap Marks) Color sheet or texture variations where one freshly painted area overlaps another.	1 First area painted has set up before overlap was made `	la Adjust material equipment and technique for weather conditions lb Work smaller areas to reduce lap time.
MUD CRACKING Cross-hatched pattern of surface cracking.	1 Excessive film build or hot, dry weather	1 Remove failed coating and recoat at recommended film thickness Add additional solvent or slower solvent to retard drying during hot, dry weather
ORANGE PEEL Fine pebbled surface texture on spray applied coating	1. Insufficient atomization	1. Sand smooth and recoat after adjusting material, equipment and technique to obtain better flow and leveling.
OVERSPRAY Rough sandy areas on spray applied work.	1 Deflected spray mist that settles on dry or partially dry coated surfaces	1. Sand smooth and recoat using proper application technique and lap time. Protect dry film from overspray.
PINHOLING Small holes or discontinuities in the film. May be microscopic.	1. Solvent migration through the film after the film has begun to set. (Also see - "Bubbling" and "Cracking.")	la. If occasional pinholes are detected, touch-up or recoat lb. If pinholing is a general surface condition, it indicates that coating was applied and cured under adverse environmental conditions. Apply a thin or mist coat to fill surface voids, followed by a full wet coat when environmental conditions are suitable for recoating

GENERAL SYSTEM/MATERIAL DATA

COMMON **PAINT** FINISHES/COATINGS **IRREGULARITIES**

Film Irreaularities	Probable Cause	Correction
ROLLER TRACKS (a) V-Shaped texture pattern on roller applied surface (Chicken Tracks) or (b) Lines at edge of roller passes	1 Use of long nap roller cover on smooth surfaces 2 Materral not properly thinned 3 Material not rolled properly	1 Change to shorter nap roller cover 2 Make solvent adjustment to improve flow and leveling 3 Sand runs smooth and recoat with properly thinned material
RUNS Heavy V-shaped or pencil shaped vertical build-ups on surface of coating	1 Excessive film build 2. Overthinning	1 Sand runs smooth and touch-up or recoat 2 Sand runs smooth and recoat with properly thinned material
SAGS Heavy U-shaped buildups or horrzontal lips on the surface of coatings (Long sags may also be referred to as curtarns.)	1 See "Runs "	1 See "Runs "
SANDY (Appearance) Dull, rough appearance of film.	1. Dust and dirt contam-ination of the wet film.	1. Sand smooth and recoat protect freshly painted areas against dust and dirt contamination or sus-pend painting operations until environmental condi-tions are satisfactory
SHADOWING See "Hiding."		
SOLVENT TRAP Residual solvents remaining within film	1. Excessive film build 2. Low temperature curing.	1. Try to drive solvents out of film by force drying. (See manufacturer's data.) Test for hardness and adhesion If film will not adhere or cure properly, remove and recoat. 2. Same as "1 ."

GENERAL SYSTEM/MATERIAL DATA

INTERIOR PAINT SYSTEMS

Material	Surfaces	Finish	Vehicle Type
Wood, Painted	Doors, Trim, Cabinets, Walls, Ceilings, Plywood, Paneling, Framing	Flat	Vinyl Acrylic Latex
			Vinyl Latex
			Alkyd
		Eggshell	Vinyl Acrylic Latex
		Pearl	Vinyl Acrylic Latex
		Satin	Alkyd
		Semi-Gloss	Vinyl Acrylic Latex
			Alkyd
			Epoxy-Polyester
		High Gloss	Acrylic Latex
			Alkyd
			Epoxy-Polyester
			Polyamide Epoxy
			Acrylic Epoxy
	Fire-Retardant All Wood Surfaces	Flat	Latex
	Floors, Enameled	High Gloss	Alkyd
			Modified Epoxy
Wood, Stained/ **Filled** or Natural/ **Filled** or Clear Finish	Floors, Doors, Trim, Cabinets, Paneling, Framing, Open Beam Ceilings & Gymnasium Floors	Clear Sealer, Satin	Vinyl Toulene Modified Alkyd Resin
		Mellow Sheen	Castor-Rosin Ester
		Clear Fat	Polyurethane
		Clear Low Lustre	Latex
			Polyurethane
		Satin	Alkyd
		Clear, High Gloss	Latex
			Polyurethane
Wood, New, to be Stained	Floors, Doors, Trim, Cabinets, Paneling, Framing	Penetrating Stain	Alkyd
		Masking Stain	Alkyd

GENERAL SYSTEM/MATERIAL DATA

INTERIOR PAINT SYSTEMS

Material	Surfaces	Finish	Vehicle Type
Plaster and Drywall	Smooth, Textured, Sand Finish, Plaster, Gypsum, Wallboard & Composition Board	Flat	Vinyl Acrylic Latex
			Vinyl Latex
			Alkyd
		Eggshell	Vinyl Acrylic Latex
		Pearl	Vinyl Acrylic Latex
		Satin	Alkyd
		Semi-Gloss	Vinyl Acrylic Latex
			Alkyd
			Epoxy-Polyester
		High Gloss	Acrylic Latex
			Alkyd
			Epoxy-Polyester
			Modified Epoxy
			Polyamide Epoxy
			Acrylic Epoxy
	Fire-Retardant All Surfaces	Flat	Latex
Pre-Wall- Covering Surface Conditioner	Previously Painted, Hard or Glossy Surfaces	Flat	Acrylic Latex 100% Acrylic Primer
	Bare Wallboard	Low Lustre	Vinyl Acrylic Latex
	For use under Pre-pasted or heavy wallcoverings		crylic Latex
Fast-Dry Stain Suppressant Primers	Bare or Previously Painted Wallboard, Plaster, Wood & Masonry	Low Lustre	Solvent

GENERAL SYSTEM/MATERIAL DATA

INTERIOR PAINT SYSTEMS

Material	Surfaces	Finish	Vehicle Type
			Vinvl Acrvlic Latex
Masonry	Poured &	Flat	Vrnyl Latex
	Precast		Alkyd
	Concrete,	Eggshell	Vrnyl Acrylic Latex
	Cement &	Pearl	Vinyl Acrylic Latex
	Cinder	Satin	Vrnyl Acrylic Latex
	Block,	Satin	Alkyd
	Walls &		Vrnyl Acrylic Latex
	Ceilings	Semr-Gloss	Alkyd
			Epoxy-Polyester
			Acrylic Latex
			Alkvd
		High Gloss	Epoxy-Polyester
			Modified Epoxy
			Polvamide Epoxv
			Acrylic Epoxy
	Fire-Retardant All Surfaces	Flat	Latex
		Low Sheen	Silicone Acrylic
		Satin	Epoxy Modified
			Acrylic Latex
			Alkyd
		High Gloss	Modified Epoxy
			Polyamide Epoxy
Metal,	Structural		Vinyl Acrylic latex
Ferrous	Steel,	Flat	Vinyl Latex
	Trusses,		Alkyd
	Beams,	Eggshell	Vinyl Acrylic Latex
	Doors,	Pearl	Vinyl Acrylic Latex
	Sash, Trim,	Satin	Alkyd
	Ornamental		Vinyl Acrylic Latex
	Iron,	Semr-Gloss	Alkyd
	Cabinets,		Epoxy-Polyester
	Lockers,		Acrylic Latex
	Handrails,	High Gloss	Alkyd
	Partitions,		Epoxy-Polyester

GENERAL SYSTEM/MATERIAL DATA

INTERIOR PAINT SYSTEMS

Material	Surfaces	Finish	Vehicle Type
Metal, Ferrous (Continued)	Vents, Stairs, Catwalks Masonry Motors	High Gloss (Continued)	Modified Epoxy
			Polyamide Epoxy
			Acrylic Epoxy
		Aluminum	Linseed Coumerone Indene
			Alkyd
Metal, Galvanized Iron	Doors, Ducts, Vents, Miscellaneous Surfaces	Flat	Vinyl Acrylic Latex
			Vinyl Latex
			Alkyd
		Eggshell	Vinyl Acrylic Latex
		Pearl	Vinyl Acrylic Latex
		Satin	Alkyd
		Semi-Gloss	Vinyl Acrylic Latex
			Alkyd
			Epoxy-Polyester
		High Gloss	Acrylic Latex
			Alkyd
			Epoxy-Polyester
			Modified Epoxy
			Polyamide Epoxy
			Linseed Coumerone Indene
Metal Ferrous	Fire Retardant	Flat	Latex
Metal, Galvanized			

GENERAL SYSTEM/MATERIAL DATA

SPECIAL COATINGS SYSTEMS & APPLICATIONS

Exposure	Applications	Type System	Resistance													
			ALCOHOLS	ALIPHATIC HYDROCARBONS	ALKALI SOLUTIONS	AROMATIC HYDROCARBONS	FRESH WATER	KATONES	MINERAL ACIDS	MINERAL OILS	ORGANIC ACIDS	OXIDIZING AGENTS	SALT SOLUTIONS	VEGETABLE OILS	WASTE WATER	WEATHERING
Rural, Urban Light Industrial	Warehouses, Manufacturing Plants, Schools, Storage Tank Exteriors	Alkyd Primer &Alkyd Topcoat	③	③	④	④	③	④	④	①	④	④	④	④	④	G
Mild Chemical	Wood Yards, Plywood Plants Sawmills	High Build Epoxy Polyamide Cured & Urethane Topcoat	①	①	①	③	①	④	③	①	③	③	①	①	①	E
Fresh & Salt Water Immersion: Moderate Chemical Exposure	Pilings, Waste Treatment Plants, Pulp & Paper Mills, Marine Structures & Barges, Cogeneration	Coal Tar Epoxy Polyamide Cured	①	①	①	①	②	④	③	①	③	③	②	①	②	F
Fresh & Potable Water Immersion	Water Storage Tank Interiors, Locks & Water Control Gates	High Build Epoxy Amine Cured	①	①	①	①	②	③	③	①	③	③	②	②	②	F
Severe Chemical	Pulp & Paper Mills, Coal Handling, Chemical Plants, Sour Crude Refineries, Fertilizer Plants	High Build Epoxy Polyamide Cured & Urethane Topcoat	①	①	①	③	①	③	③	①	③	③	①	①	①	E
Severe Chemical-Acid Resistance	Pulp & Paper Mills, Dockside Exposures, Fertilizer Plants, Acid Loading Docks, Dye Plants	High Build Epoxy Amine Cured	①	①	①	①	②	③	③	①	③	③	②	②	②	F
Severe Chemical-Alkali & Solvent Resistance	Pulp & Paper Mills, Coal Handling Facilities, Dockside Exposures	Organic Zinc Rich Epoxy Primer & High Build Epoxy Polyamide Cured Topcoat	①	①	①	①	②	③	③	①	③	③	①	①	②	F
Severe Chemical-Alkali Resistance	Capital structures where color & gloss retention are needed	Organic Zinc Rich Epoxy Primer, High Build Epoxy Polyamide Cured & Urethane Topcoat	①	①	①	③	①	③	③	①	③	③	①	①	①	E
Severe Chemical solvent & Alkali Resistance	New Construction, Pulp & Paper Mills, Power Plants, Coal Liquification, Cogeneration	inorganic Zinc Rich Primer & High Build Epoxy Polyamide Cured Topcoat	①	①	①	①	②	③	③	①	③	③	①	①	②	F

GENERAL SYSTEM/MATERIAL DATA

SPECIAL COATINGS SYSTEMS & APPLICATIONS

Exposure	Applications	Type System	Resistance: ALCOHOLS	ALIPHATIC HYDROCARBONS	ALKALI SOLUTIONS	AROMATIC HYDROCARBONS	FRESH WATER	KATONES	MINERAL ACIDS	MINERAL OILS	ORGANIC ACIDS	OXIDIZING AGENTS	SALT SOLUTIONS	VEGETABLE OILS	WASTE WATER	WEATHERING
evere Chemical	Where gloss retentron and color are impor-tant	Zinc Rich Primer & Urethane Topcoat	①	①	①	③	①	①	③	③	①	③	③	①	①	E
ligh Temperature up to 1 200° F)	Stacks, Incinerators, Super Heated Steam Lines, Boiler Casings & Drums	Heat Resistant Sili-cone Aluminum	③	③	④	④	④	④	④	①	④	④	④	④	④	E
nmersion, evere Exposures	Waste Treatment Plts , Pulp & Paper Mills, Cogeneration, Power Plants., Sour Crude Exposures	Coal Tar Epoxy Polyamide Cured	①	①	①	③	②	④	③	①	③	③	②	①	②	F

CODES: ① = frequent contact; ② = immersion; ③ = occasional contact, ④ = not recommended; F = fair, G = good; E = excellent

END OF SUBSECTION

0.06.01 .Ol CONCRETE/MASONRY (CSI 04200)

DESCRIPTION

Because of their strength, **vet** satility, and economy, masonry assemblies are among the most frequently used materials for constructing walls and partitions. They may be used foı many different types of bearing and nonbearing wall structures, including exterior and interior walls, infill panels, interior partitions, and fire walls. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Continuous Metal Ties (CSI 04150)

Continuous metal ties are called prefabricated joint reinforcement, mesh, or more commonly, joint reinforcement. Consisting of two or more parallel longitudinal wires to which cross wires are welded, joint reinforcement may be used for the following reasons:

- To act as horizontal reinforcement.
- To act as longitudinal reinforcement to control cracking due to drying shrinkage and temperature changes.
- To bond the wythes without using unit metal ties.

Joint reinforcement and ties must be corrosion-resistant. Cross wires are welded diagonally or perpendicularly to the longitudinal wires, usually at 16-inch spacings. The longitudinal wires are deformed to obtain a better bond with the mortar.

Control Joints (CSI 04150)

Control joints, also called contraction or movement joints, are continuous, vertically weakened sections built into the wall. If stresses or wall movements are sufficient to crack the wall, the cracks will occur at the control joints and be inconspicuous.

A control joint must permit ready movement of the wall in a longitudinal direction and be weatherproofed. In addition, it may be required to stabilize the wall laterally across the joint.

There are a number of types of control joints for building concrete masonry walls, but the most common types are the Michigan, tongue and groove, and the premolded gasket.

- The Michigan uses conventional flanged units. A strip of building paper is curled into the end core covering the end of the block on one side of the joint laid, and the core is filled with mortar. The filling bonds to one block but the paper prevents bond to the block on the other side, thus the control joint permits longitudinal movement of the wall while the mortar plug transmits transverse loads.
- The tongue and groove is manufactured in sets consisting of full-length and half-length units. The tongue of one special unit fits into the groove of another or into the open end of a regular flanged stretcher. The units are laid in mortar exactly the same as any other masonry units. Also, part of the mortar is allowed to remain in the vertical joint to form a backing against which the caulking can be placed.
- Premolded gaskets allow movement at joints while maintaining wall alignment perpendicular to wall movement. These anchors are also adaptable for attaching concrete masonry walls to wood, steel, or concrete.

0.06.01 .OI CONCRETE/MASONRY (CSI 04200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS (Continued)

Flashing (CSI 04150)

Flashing is installed in masonry construction to divert moisture, which may enter the masonry at vulnerable spots, to the outside. Flashing is provided under horizontal masonry surfaces such as sills and copings, at intersections of masonry walls with horizontal surfaces such as roof and parapets, overheads of openings such as door and windows, and frequently at floor lines. To be most effective, the flashing usually extends through the outer face of the wall and is then turned down to form a drop. Weepholes are provided at intervals of 18 inches to 2 feet to permit water accumulated on the flashing to drain to the outside.

Mortar Types (CSI 04100)

The following types of mortar are proportioned on a volume basis.

- Type S is for general use and is recommended where high resistance to lateral forces is required.
- Type N is suitable for general use in exposed masonry above grade and is recommended specifically for exterior walls subjected to severe exposures. This mortar is recommended for load-bearing walls of solid units where the compressive stresses do not exceed 100 psi and the masonry will not be subjected to freezing and thawing in the presence of excessive moisture.

Joint Finishing:

Exterior surfaces of mortar joints are finished to make the brickwork more waterproof and to improve appearance. There are several types of joint finishes. When joints are cut flush with the brick and not finished, cracks can easily occur between the brick and mortar.

The concave joint is best from the standpoint of weather-tightness. It is made with a special tool after the excess mortar has been removed with the trowel.

The flush joint is the next best, followed by the weather joint, which sheds water more easily from the wall surface.

Concrete Masonry Walls (CSI 04200)

May be classified as solid, hollow, cavity, composite, veneered, reinforced, or grouted. The classifications sometimes overlap, but the basic terminology and bonding directions remain the same. Modern concrete masonry wall construction is of two general types: unreinforced (plain) and reinforced. These classifications are characterized by some differences in mortar type requirements, use of reinforcing steel, and erection techniques. Both types are usually subject to the provisions of applicable building codes.

Unreinforced (plain) concrete masonry has been in use for many years. Essentially unreinforced, any steel reinforcement used in this type of concrete masonry is generally light gauge and placed in relatively small quantities in the horizontal joints.

Reinforced concrete masonry, on the other hand, contains reinforcing steel placed and embedded so that the masonry and steel act together in resisting forces. This structural behavior is obtained by placing deformed reinforcing steel bars in continuous vertical and horizontal cores or cavities in the masonry. By filling these spaces with properly consolidated Portland cement grout, the bars and masonry units, permit reinforced concrete design theory to be adapted to produce a building of reinforced concrete masonry.

0.06.01 .01 CONCRETE/MASONRY (CSI 04200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Concrete Masonry Walls (CSI 04200) (Continued)

Reinforced concrete masonry is used where the compressive, flexural, and shear loads are higher than can be accommodated with plain concrete masonry. It is required by code in areas of recurring hurricane winds or earthquake activity where major damage to buildings is highly probable.

Various methods may be employed for insulating concrete block walls. Rigid foams inserts or loose perlite can be used to fill the voids in the blocks of single wythe walls. They can also be insulated by installing the insulating material between the furring strips for the interior wall face. For cavity walls, rigid-board insulation may be attached in the cavity to the surface of the inner wythe.

Different cleaning and finishing techniques may be used to enhance the appearance of block walls and protect them from the elements. Small amounts of dried mortar and soiling can be cleaned from the block surface with a stiff brush. Exterior and interior block walls can be painted or coated with a variety of opaque or clear sealers.

Masonry Brick Walls (CSI 04210)

Masonry brick construction consists of units of baked clay or shale of uniform size, small enough to be placed with one hand, and laid in courses with mortar joints to form walls of virtually unlimited length and height. Bricks are kiln-baked from various clay and shale mixtures. The dimensions of a standard building brick is 2 1/2 x 3 3/4 x 8 inches. The actual dimensions of brick may vary a little due to shrinkage during burning.

Brick is among the most popular of wall materials because it is durable, economical to maintain, readily available in most areas, and varied in size and color. Brick can be used alone in single wythe walls or as the facing material in composite or cavity walls. Although the insulating value of a single wythe brick wall is low (1.6 rating), it has the relatively high fire rating of one hour.

Brick Classification:

A finished brick structure contains “face brick” (brick placed on the exposed face of the structure) and “back-up” brick (brick placed behind the face brick). The face brick is often of higher quality than the back-up brick. However, the entire wall may be built of “common” brick made from pit-run clay, with no attempt at color control and no special surface treatment like glazing or enameling. Most common brick is red.

Types of Brick:

There are many types of bricks. Some are different in formation and composition and others vary according to their use. Some commonly used types of bricks are as follows:

Face brick is used in the exposed face of a wall and is higher quality units than back-up brick: it has better durability and appearance. The more common colors of face brick are various shades of brown, red, gray, yellow, and white.

Ceramic glazing consists of mineral ingredients thatfuse together in a glass-like coating during burning. This type of brick is generally used in or well suited for hospitals, dairies, laboratories, or other buildings where cleanliness and ease of cleaning are necessary.

Fire brick is made of a special type of fire clay that will withstand the high temperatures of boilers and similar uses without cracking or decomposing. Fire brick is generally larger than regular structural brick and is often hand-molded.

0.06.01 .Ol CONCRETE/MASONRY (CSI 04200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Masonry Brick Walls (CSI 04210)

Types of Brick (Continued):

Cored brick is made with two rows of five holes extending through the bed to reduce weight, There is no significant difference in strength between walls constructed with cored brick and those constructed with solid brick. Resistance to moisture penetration is about the same for both types of walls. The most easily available brick that will meet requirements should be used, whether it is cored or solid.

Sand-lime brick is made from a lean mixture of slacked lime and fine siliceous sand molded under mechanical pressure and hardened under steam pressure.

Brick Mortar (CSI 04100)

Mortar is used to bond the brick together. Unless the mortar is properly mixed and applied, it will be the weakest part of brick masonry assembly. Both the strength and resistance to moisture penetration of brick masonry walls depends on the strength of the bond; brick walls usually leak through the mortar joints. Water in the mortar is essential to the bond development; if the mortar contains insufficient water, the bond will be weak and spotty.

Stone Masonry (CSI 04400)

Building stone masonry can be used for many different types of structures and come in various configurations. Small, irregular building stone that has been quarried in random sizes is called “rubble” or “field-stone.” Flat, random pieces of rubble can also be assembled without mortar and will derive strength from the interlocking of adjacent pieces within the structure. Fieldstone may be split by hand onsite to provide a flat exterior surface for a patterned wall or fireplace.

Because of its durability, strength, and unique appearance, stone provides a wide range of structural and decorative applications as a building material. It can be installed in small units, referred to as “building stone,” which can be assembled in many different formats, with or without mortar, to create walls and veneers of all sorts.

Tvoes of Stone:

Stone masonry units consist of natural stone. In rubble stone masonry, the stones are left in their natural state without any kind of shaping. Ashlar masonry, stones whose faces are placed in a smooth horizontal plane, are squared so that the surface of the finished structure will be more or less continuous. Both rubble and Ashlar work may be either coursed or random.

Random rubble is the roughest of all types of stonework. Little attention is paid to laying the stones in courses. Each layer must contain bonding stones that extend through the wall to produce a wall that is well tied together. The bed joints may run in any direction.

Coursed rubble is assembled of roughly squared stones to produce approximately continuous horizontal bed joints.

0.06.01 .Ol CONCRETE/MASONRY (CSI 04200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Stone Masonry (CSI 04400)

Types of Stone (Continued):

Small stone units may also be quarry-split and processed to meet aesthetic needs. For example, decorative building stone can be purchased by the ton in 4-inch thick slabs, available in lengths ranging from 6 to 14 inches and in heights ranging from 2 to 16 inches. These pieces are commonly installed with mortar to create veneer walls of varying patterns, such as ledge stone, spider web, uncoursed rectangular, and squared. Ashlar stone, also priced by the ton, is the name given to building stones that have been sawn on the edges to produce a rectangular face. This shape makes Ashlar stone another veneer material because the pieces can be arranged in either a regular or random-coursed pattern within the face of a wall. Stone veneer can be tied to the backup wall with galvanized ties or 8-inch stone headers in a method similar to that used in brick veneer walls. The coverage of stone veneer ranges from 35 to 50 square feet per ton for 4-inch wide veneer, with correspondingly reduced coverages per ton for veneers of 6 and 8 inches in width.

Glass Block (CSI 04270)

Glass block, which was a popular building material in the 1930s, has recently undergone a revival in the construction industry, particularly for exterior walls construction. It has the dual advantage of admitting light but preventing heat transmission. The maximum free-standing wall area allowed using glass block construction is 144 square feet, but larger areas are feasible using intermediate bracing.

Glass block offers the advantages of excellent light diffusion and good thermal insulation. They also come in more decorative types. They can provide privacy yet allow limited visual accessibility, and are therefore used in places where visual is deceptive. Patterns may be introduced into the glass during the forming process. Ceramic designs can be fused to the surface for a decorative finish, but this will increase the cost.

Glass block can be placed on a raised base, plate, or sill, provided that the surfaces to be mortared are primed with asphalt emulsion. Wall recesses and the channel tract that receive the glass block should be lined with expansion strips prior to oakum filler and caulking.

Jointing & Anchoring:

Horizontal joint reinforcing is specified for flexural as well as shrinkage control and is laid in the joints along with the mortar. End blocks are anchored to the adjacent construction with metal anchors, if no other provisions for attachment exist. If intermediate support is required, vertical I-shaped stiffeners can either be installed in the plane of the wall or adjacent to it, but the stiffeners should be tied to the wall with wire anchors. The top of the wall is supported between angles or in a channel track similar to the jambs.

Glass block is manufactured in sizes from 6 x 6 inches to 12 x 12 inches, with thickness from 3 to 4 inches. The block may be hollow or fused; the latter allows vision through the block. Inserts can be manufactured into the block to reduce solar transmission to the building interior.

Reinforced Concrete (CSI 03300)

Because concrete has limited resistance to tensile and shear stresses, steel reinforcing material is necessary. Rebars and/or wire mesh must have a capability of developing a bond with the concrete and be so positioned that each element will be used efficiently. The cross-sectional area of the reinforcing bar should not be reduced in any way, because the tensile capacity of the material will be reduced. A thorough knowledge of contract requirements, construction documents including shop drawings, and the placement of reinforcing steel are very important.

0.06.01 .Ol CONCRETE/MASONRY (CSI 04200)

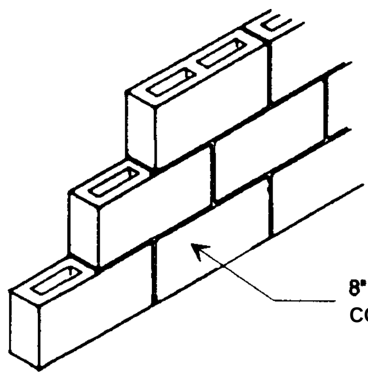
ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Reinforced Concrete (CSI 03300) (Contmued)

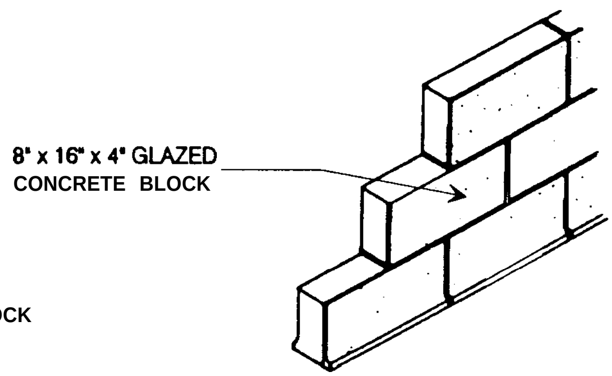
The capability of the reinforcing materials to bond with the concrete must not be destroyed in any way. Before placement, the reinforcing must be thoroughly cleaned of loose or flaky rust, mill scale, ice, oil, or any other substance that might reduce or destroy the bond. This will include the cleaning of any steel that may have been contaminated after placement.

OTHER RELATED COMPONENTS

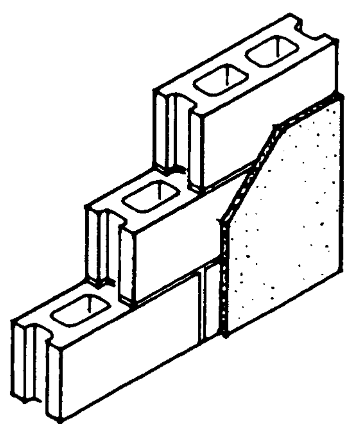
Refer to Foundations & Footing and Superstructure Systems, Volumes 1 and 3, for additional deficiencies that may impact this system.



NONBEARING CONCRETE BLOCK PARTITION



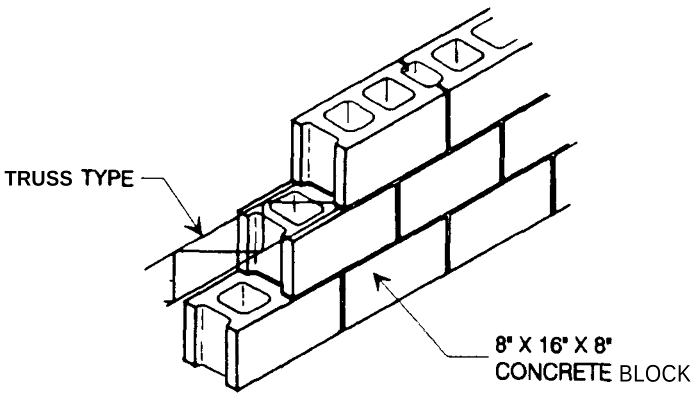
GLAZED CONCRETE BLOCK



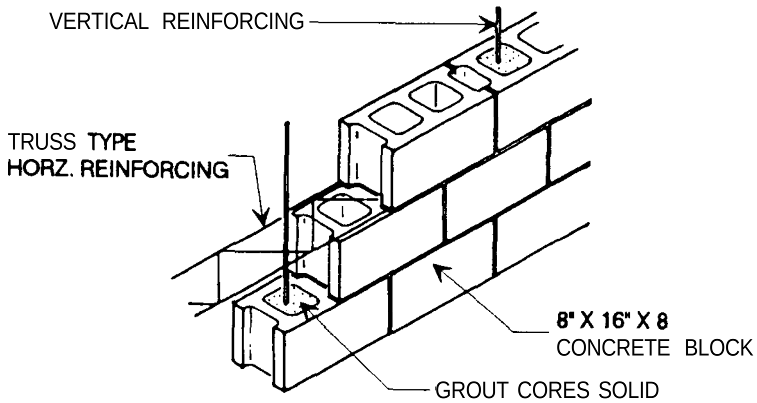
PLASTER DIRECT TO BLOCK

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

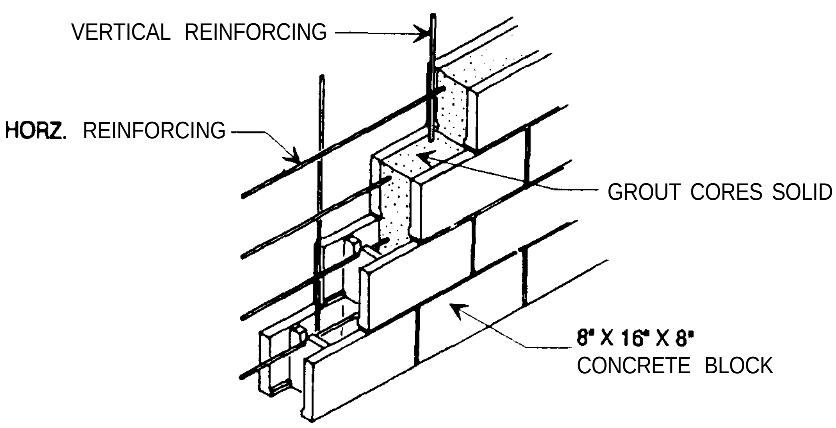
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	VARIOUS CMU PARTITIONS		
PARTITIONS CONVENTIONAL CONCRETE/MASONRY (CSI 04220)	Revision No.	Issue Date 5/93	Drawhg No. A060101-1



WIRE STRIP JOINT REINFORCING



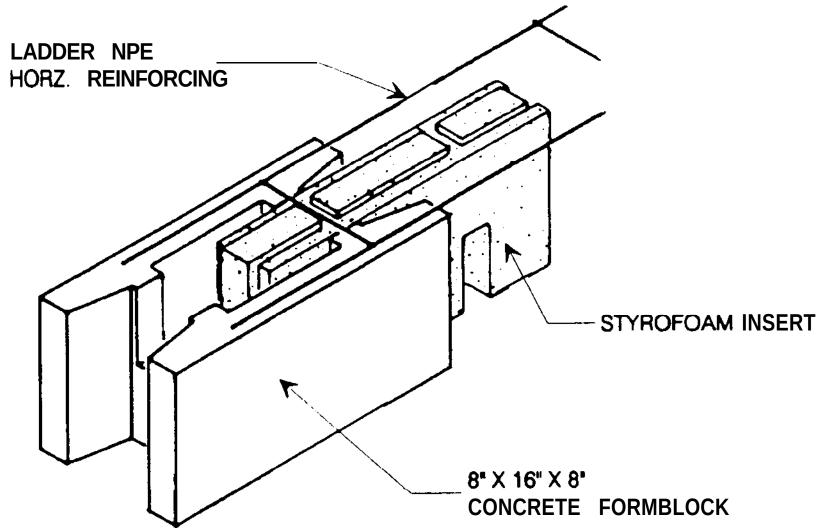
REINFORCED CONCRETE BLOCK WALL



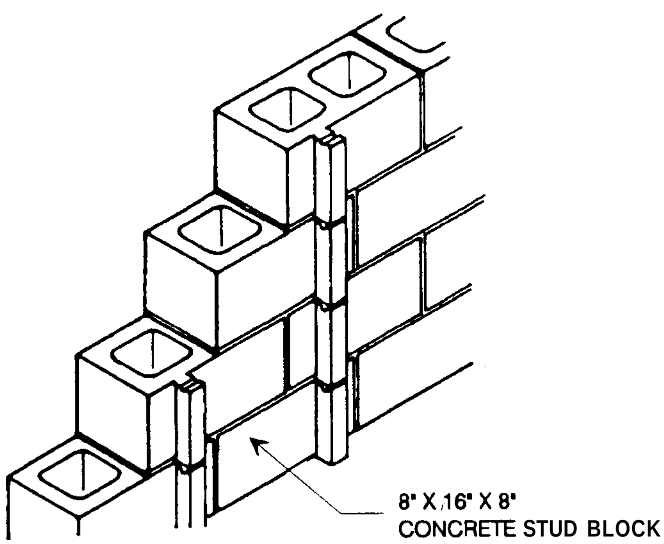
INTERLOCKING CONCRETE BLOCK

SOURCE MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	VARIOUS CMU PARTITIONS		
PARTITIONS CONVENTIONAL CONCRETE/MASONRY (CSI 04220)	Revision No.	Issue Date 5/93	Drawing No. A060101-2



INSULATED CONCRETE BLOCK



SELF-FURRING CONCRETE BLOCK

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	VARIOUS CMU PARTITIONS		
PARTITIONS CONVENTIONAL CONCRETE/MASONRY (CSI 04220)	Revision No.	Issue Date 5/93	Drawing No. A060101-3

DEFICIENCY FACTORS
0.06.01 .01 CONCRETE/MASONRY (CSI 04200)

PROBABLE FAILURE POINTS

- A wide variety of poor construction practices can result in cracking in a CMU/masonry structure, especially adding water to mortar to improve workability. Added water has the effect of reducing strength, increasing settlement, and increasing ultimate drying shrinkage.
- Construction overloads induced during construction can be far more severe than those experienced in the lifetime of the structure. Unfortunately, these conditions may occur at early ages when the concrete is most susceptible to damage and often result in cracks.
- Errors in design and detailing range from poor appearance to lack of serviceability to catastrophic failure.
- A number of deleterious chemical reactions may result in mortar cracks. These reactions may be due to the aggregate used to make mortar or materials that come into contact with it after it has hardened or cured.

SYSTEM ASSEMBLIES/DEFICIENCIES

Masonry

Staining:	Discoloration in the surface of a material from a foreign substance or material.
Efflorescence:	A whitish powdery deposit of soluble salts brought to the surface by moisture. Leaves residue after evaporating.
Mildew/Fungi:	The growth of bacteria life such as fungi over the surface usually from excessive moisture.
Inadequate Expansion Joint:	Lack of expansion or control joints resulting in surface cracks from stresses.
Damaged/Missing Sections:	Broken, damaged, cracked, or missing units or sections.
Corrosion:	Corrosion of steel lintel/shelf angle.
Cracks:	Settlement, inadequate finishing and curing. Stress concentration. Structural design. Excessive overload, fatigue, and earthquake.
Spalling:	Fragment flakes from the surface due to pressure.
Out-of-Alignment:	Bowing, deflection, or other movement that brings the surface out-of-plumb or not level in one or more directions.
Joint Mortar Deteriorated/Missing:	Caused by weather, incorrect mortar joints, settlement.
impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.

DEFICIENCY FACTORS
0.06.01.01 CONCRETE/MASONRY (CSI 04200)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES a CONSTRUCTION	EFFLORESCENCE ON MASONRY UNITS		
PARTITIONS CONVENTIONAL CMU/MASONRY (CSI 04200)	Revision No.	Issue Date 5/93	Drawing No. D060101-1

DEFICIENCY FACTORS
0.06.01 .01 CONCRETE/MASONRY (CSI 04200)

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DEFICIENCY FACTORS
0.06.01 .01 CONCRETE/MASONRY (CSI 04200)

END OF SUBSECTION

0.06.01.02 STRUCTURAL, FACING TILE (CSI 04210)

DESCRIPTION

Structural glazed facing tile (SGFT) is kiln-fired structural clay with an integral impervious ceramic face. It is also manufactured with an acoustical perforated face. SGFT resists stains, marks, impact, abrasion, fading, and crazing and is ideally suited for use in schools corridors, locket rooms, restrooms, kitchens, and other places where cleanliness and indestructibility are primary considerations. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Structural Clay **Tile** (CSI 04210)

Structural clay tile is formed into hollow units with parallel cells. Various sizes are produced in nominal 4, 6, and 8 inch widths and 6, 8, and 16 inch heights and lengths. SGFT is available in a large selection of colors and color combinations.

Some available tile shapes include stretchers, bullnose jamb or corner, square jamb or corner, coved internal corner, recessed cove base, nonrecessed cove base, bullnose sill, square sill, and universal miter.

Structural clay tile without glazing is used for load-bearing masonry walls that will be finished with other materials, as backup for exterior walls and as non-bearing interior partitions. Units are also available with various glazed surfaces appropriate for finished exterior or interior walls.

OTHER RELATED COMPONENTS

See the following subsections for related components:

0.06.01 .01	Concrete/Masonry	2.1	.1-1

0.06.01.02 STRUCTURAL, FACING TILE (CSI 04210)

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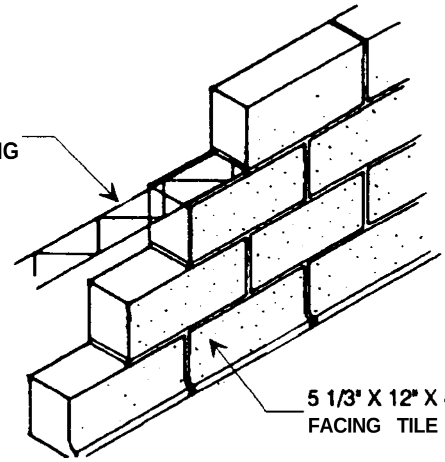
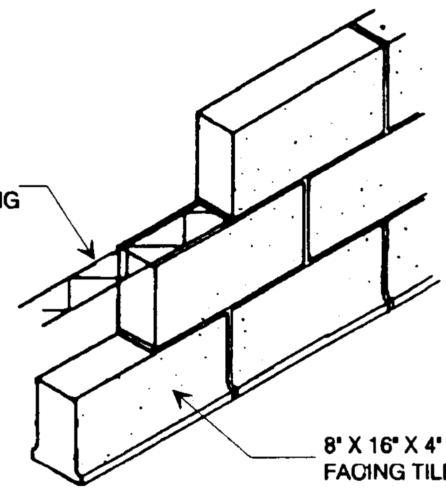


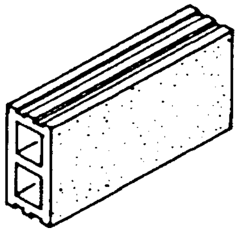
6T SERIES STRUCTURAL GLAZED FACING TILE



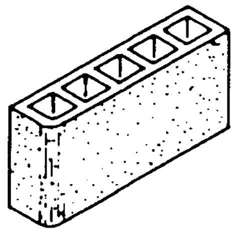
8W SERIES STRUCTURAL GLAZED FACING TILE

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

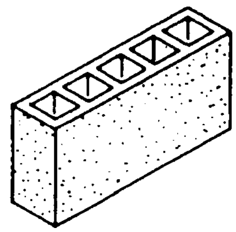
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	STRUCTURAL GLAZED FACING TILES		
PARTITIONS CONVENTIONAL STRUCTURAL, FACING TILE (CSI 04210)	Revision No.	Issue Date 5/93	Drawing No. A060102-1



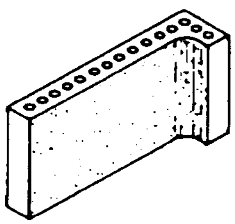
STRETCHER



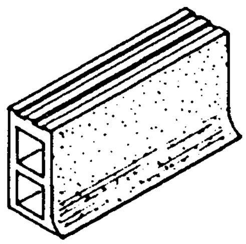
BULLNOSE JAMB
OR CORNER



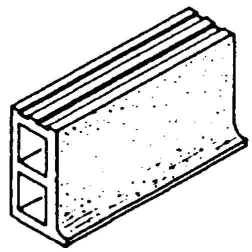
SQUARE JAMB
OR CORNER



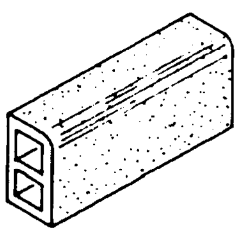
COVED INTERNAL
CORNER



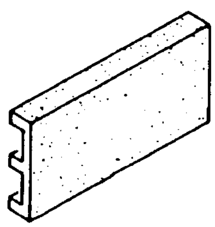
RECESSED COVE BASE



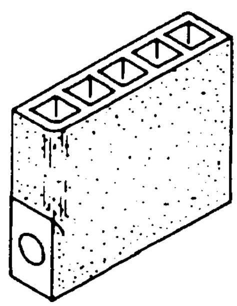
NON-RECESSED
COVE BASE



BULLNOSE SILL



SQUARE SILL



UNIVERSAL MITER

SOURCE MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R S. Means Co., Inc Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	TRIM PIECES STRUCTURAL FACING TILES		
PARTITIONS CONVENTIONAL STRUCTURAL, FACING TILE (CSI 04210)	Revision No.	Issue Date 5/93	Drawing No. A060102-2

DEFICIENCY FACTORS
0.06.01.02 STRUCTURAL, FACING TILE (CSI 04210)

PROBABLE FAILURE POINTS

- Chipping or cracking caused by impact damage, uneven settlement
- Joint deterioration caused by flaking, spalling, improper mortar mix
- Missing sections caused by impact damage.
- Masonry displacement caused by excessive loading, lateral movement against the masonry, heavy equipment, and pushing toward the wall.

SYSTEM ASSEMBLIES/DEFICIENCIES

Structural Clay Tile

Damaged/Missing Section:	Broken, damaged, cracked, or missing units or sections.
Staining:	Surface discoloration from foreign substance or material.
Spalling:	Fragment flakes from the surface due to pressure.
Out-of-Alignment:	Bowing, deflection, or other movement that brings the surface out-of-plumb or not level in one or more directions.
Cracks (Active and Dormant):	Settlement, inadequate finishing and curing. Stress concentration. Structural design. Excessive overload, fatigue, and earthquake.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.

DEFICIENCY FACTORS
0.06.01.02 STRUCTURAL, FACING TILE (CSI 04210)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	EFFLORESCENCE ON STRUCTURAL FACING TILE		
PARTITIONS CONVENTIONAL STRUCTURAL, FACING TILE (CSI 04200)	Revision No.	Issue Date 5/93	Drawing No. 0060102-I

DEFICIENCY FACTORS
0.06.01.02 STRUCTURAL, FACING TILE (CSI 04210)

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DEFICIENCY FACTORS
0.06.01.02 STRUCTURAL, FACING TILE (CSI 04210)

END OF SUBSECTION

0.06.01.03 DRYWALL/PLASTER (CSI 09200)

DESCRIPTION

Gypsum wallboard is one of the most commonly used materials for interior finishing in commercial and residential structures. It is inexpensive and can satisfy most requirements for partitions in today's construction. Gypsum wallboard, also known as drywall, is made of a gypsum plaster core sandwiched between sheets of paper or other materials.

Plaster is a finish material made from various types of cementing compounds, fine aggregate, and water. It is applied over several kinds of base materials in two or three coats to form a smooth, level surface. Plaster is a term commonly used for interior application.

Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Framing (CSI 06110/09100)

Gypsum wallboard and plaster are attached to various types of framing; they vary from wood stud walls to CMU blockwalls.

Wood stud partitions may be fabricated of 2 x 3 inches, 2 x 4 inches etc. spaced at 12, 16, or 24 inches on-center. Wood studs may be clad with drywall, plaster, composition board. Drywall on block walls are usually installed on furring strips (either wood or steel). (Primarily residential construction.)

Steel studs are formed or fabricated from light-gauge metal in standard lengths and various widths and configurations. They are designated to be load-bearing and non-loadbearing, depending on the gauge of material used in manufacture. Non-bearing studs for drywall are available in 25 and 20 gauge, in 1 1/2, 2, 2 1/2, 3 1/2, 3 5/8, 4, and 6 inch depths, with track and bridging to match the studs. C studs are available in 18, 16, and 14-gauge, in depths varying from 1 5/8 to 12 inches.

Studs are available factory-painted or galvanized. Load bearing studs are available in lengths of 7 to 37 feet, in l-inch increments. Drywall studs are available in stand lengths varying from 8 to 20 feet. Studs for partitions walls may be covered with gypsum, metal lath and plaster, or gypsum drywall of various thicknesses and laminations.

Drywall (CSI 09200)

Drywall normally comes in 4 x 8-foot sheets, although 10 x 12-foot lengths are available. One inch -thick coreboard comes in 2-foot widths. Thicknesses range from 1/4 to 5/8 inch; l-inch coreboard is used for shaft lining.

Drywall is available with square edges, tapered edges, and tongue-and groove edges. The tapered edge is the most commonly used because the slight taper allows joint compound and tape to be applied without showing a bulge in the finished surface.

Other types available include Type X for fire retardant partitions, foil-backed for vapor barriers, water-resistant for use behind tile and in other moist conditions, and exterior soffit board.

Drywall is applied by nailing or screwing it to wood or metal framing, or with mastic when applying it to concrete or masonry walls. The joints are finished by embedding paper or fiberglass tape in a special joint compound and allowing it to dry.

0.06.01.03 DRYWALL/PLASTER (CSI 09200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Drywall (CSI 09200) (Continued)

Drywall Trim:

Like plaster walls, drywall must have fabricated edging. This includes corner-bead, which is used to finish exterior and interior corners.

Trim types are used for edging, with most requiring finishing with joint compound. Some trims are used for installation after the drywall has been installed, such as a U-bead (sometimes called a J-channel). It does not require finishing with a joint compound, but the edge is very noticeable.

Plaster (CSI **09200)**

Plaster is made from gypsum and lime, aggregates of sand, vermiculite or perlite, and water. Vermiculite and perlite are used when a lightweight, fire-resistant plaster is needed. A special process is used to produce Keene's cement, which is a plaster that has a high resistance to abrasion and water penetration. It is used in wet areas or on walls subject to scratching or other abuse.

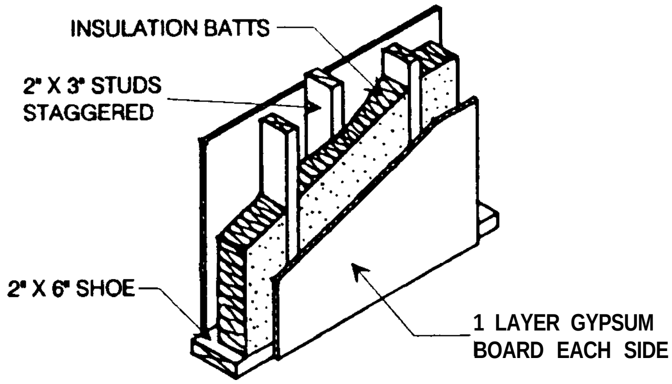
There are two common methods of applying plaster. The first is on metal lath attached to metal studs. Metal lath is available in several types: expended diamond mesh, paper-backed diamond mesh, flat rib lath, and high rib lath. Expended diamond mesh is a general-purpose type used for both flat and curved surfaces. The paper-backed diamond mesh has an asphalt-impregnated paper applied to it and is used as a base for portland cement plaster under ceramic tile. Flat rib lath is more rigid due to the one-way, V-shaped ribs about 4 inches on-center, and it is used for solid partitions.

The other method of plastering uses gypsum board lath instead of metal lath. This is a special gypsum product specifically designed for plastering. Gypsum lath comes in 16 X 48 inch boards applied over the traditional method because only one coat is needed (known as the finish coat). In metal lath, finishing includes a three-coat process. The first coat is called the scratch coat. In standard practices the scratch is followed by a brown coat, followed by the finish coat. The scratch and brown coats are applied about 1/8-inch thick.

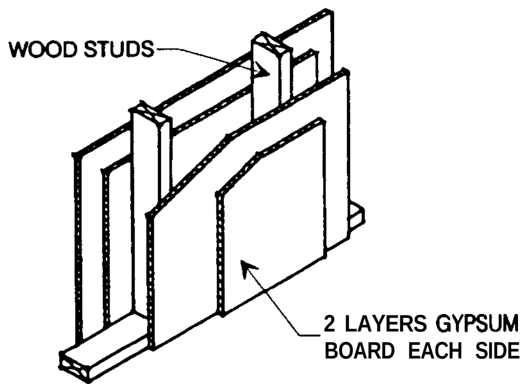
Plaster edges must be finished with various types of metal trim pieces to provide a termination point for the work and serve as screeds to give the plasterers guides for maintaining the required thickness. Common profiles include corner beads to protect the outside corners, casing beads to trim doors and other openings, and expansion joints to control plaster cracking.

OTHER RELATED COMPONENTS

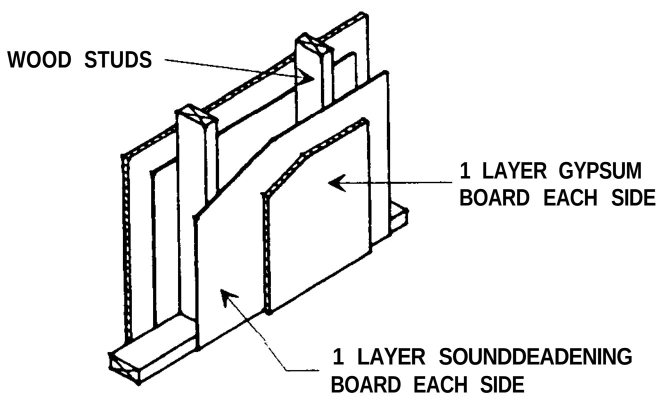
See the following subsections for related components:



STAGGERED STUD WALL



GYPSUM PLASTERBOARD, 2 LAYERS



SOUND-DEADENING BOARD

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	GYPSUM BOARD/DRYWALL SYSTEMS		
PARTITIONS CONVENTIONAL DRYWALL/PLASTER (CSI 09260)	Revision No.	Issue Dsts 5/93	Drawing No. A060103-1

DEFICIENCY FACTORS
0.06.01.03 DRYWALL/PLASTER (CSI 09200)

PROBABLE FAILURE POINTS

- Dampness/wetness caused by condensation or exterior leakage puncture.
- Exposure to in-surface damage such as cuts, tears, punctures, permanent surface indentations, and gouges.
- Improper joint finishing.
- Corroded nails or screws causing drywall stains
- In a long run of wall, lack of expansion joints causing cracks.
- Improper fastening causing nail pops, etc
- Metal lath corrosion causing plaster to stain, crack, and chip
- Inadequate mixture of plaster causing spalling.
- Lack of curing time.

SYSTEM ASSEMBLIES/DEFICIENCIES

Water Damage:	Roof leakage, sprinkler system misfunction.
Holes/Puncture:	Impact damage.
Improper Joint Finishing:	Inadequate construction.
Nail Popping/Screw Displacement:	Wall movement, improperly attached nails.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Cracking:	Stress concentration, structural settlement, excessive overload on wall.

DEFICIENCY FACTORS
0.06.01.03 DRYWALL/PLASTER (CSI 09200)

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DEFICIENCY FACTORS
0.06.01.03 DRYWALL/PLASTER **(CSI 09200)**

END OF SUBSECTION

0.06.02 PARTITIONS SPECIALTY (CSI 10650)

DESCRIPTION

Folding partitions, operable walls, and moveable partitions are manufactured in a varrety of sizes, shapes, and finishes. Operating partitions include folding accordion, folding leaf, or individual panel systems. These units may be hand or power-operated. Moveable partitions include portable, which is designed for frequent relocation, and demountable, which is designed for infrequent relocation. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Partition Specialty (CSI 10650)

Acoustic control is a major consideration in folding partitions. Sound-insulating qualities of folding partitions are expressed in terms of STC ratings on the basis of laboratory tests performed in accordance with ASTM E 90. A low STC rating describes a low resistance to sound transmission, while a high rating will resist larger amounts of sound transmission.

Accordion Folding Partitions (CSI 10655)

Accordion folding partitions are supported by aluminum, steel, or wood framing members. The panels are usually filled with a sound-insulation material. Most partitions are rated by their sound reduction qualities. Panel skin materials include aluminum, composition board, fabric, or wood. The panels may be painted or covered with carpeting, fabric, plastic laminate, vinyl, or wood paneling.

The configuration for accordion folding partitions include recessed-stacked, centered, parallel-stacked, or exposed-stack operation. Track systems are available in straight lengths or curves, or with right-angle layouts and switches. The partitions are usually top-track supported, but some models are available with floor supports.

Partitions may be installed to ceiling height with adjustable top or bottom seals, or to varied heights with end-hinged supports.

Folding Leaf Partitions (CSI 10652)

Folding leaf partitions may be manual or electric. Electrically operated partitions are continuously hinged, center-stacking units. Manually operated partitions are either continuous-hinged panels, paired panels, or individual panels. The height limitation is a maximum of 18 feet.

Panel construction for folding partitions includes three distinct types: wood frame, steel reinforced aluminum frames, or steel frame with steel face.

Wood frame construction is suitable for STC ratings up to 46. Panels range in thickness from 1 1/4 to 3 inches.

Steel reinforced aluminum frame construction is suitable for STC ratings up to 52. Face sheets ate typically gypsum or particleboard. Panel thicknesses range from 2 to 4 inches.

Steel frame with steel face construction is suitable for STC ratings up to 55. Panel thickness ranges from 2 1/4 to 4 inches.

OTHER RELATED COMPONENTS

See the following subsections for related components.

0.06.02 PARTITIONS SPECIALTY (CSI 10650)

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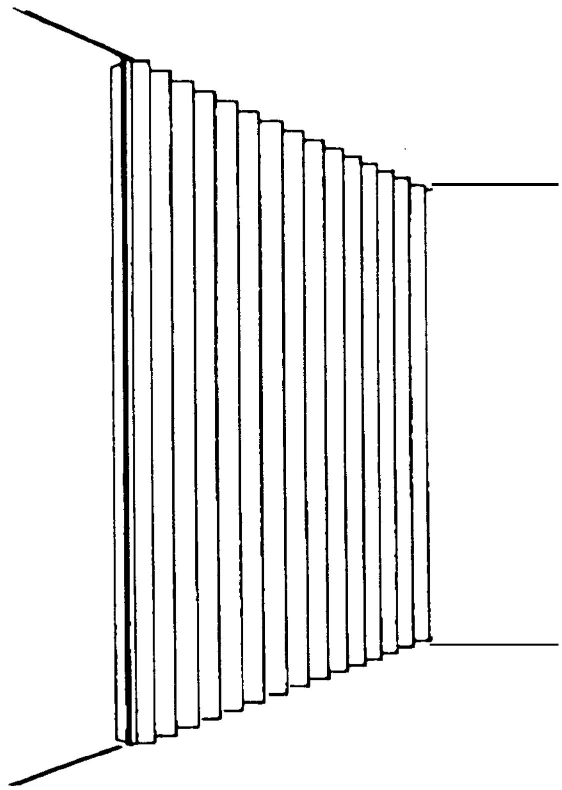
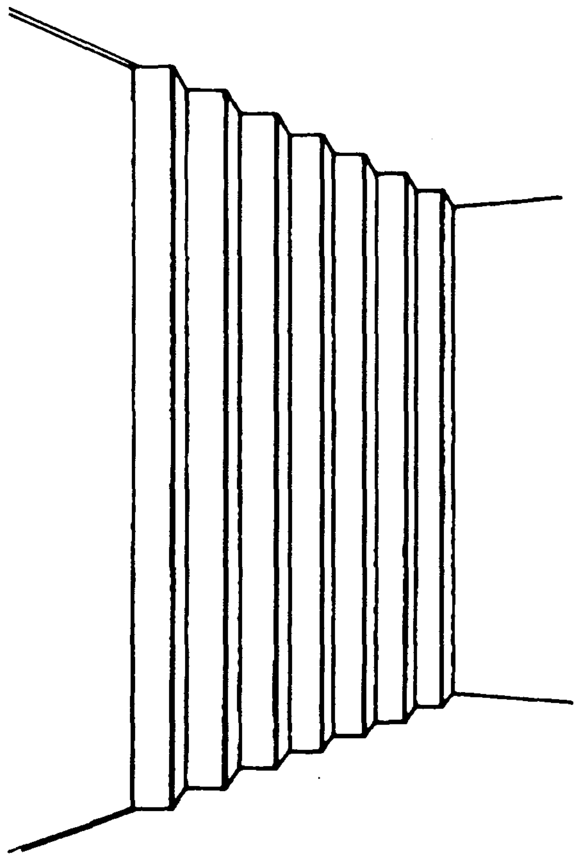


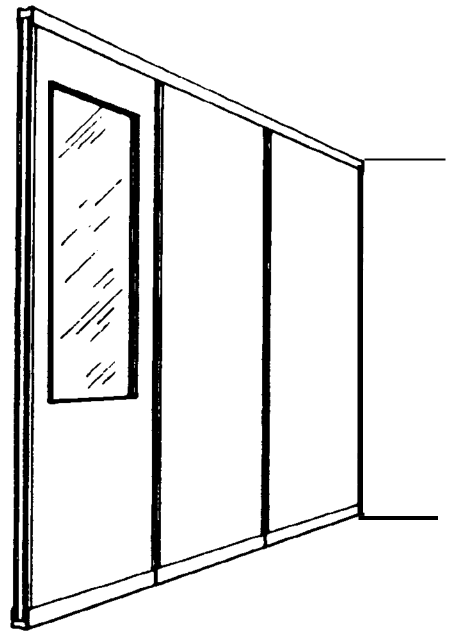
FOLDING ACCORDION PARTITION

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	MOVABLE PARTITIONS		
PARTITIONS SPECIALTY (CSI 10600)	Revision No.	Issue Date 5/93	Drawing No. A0602-1

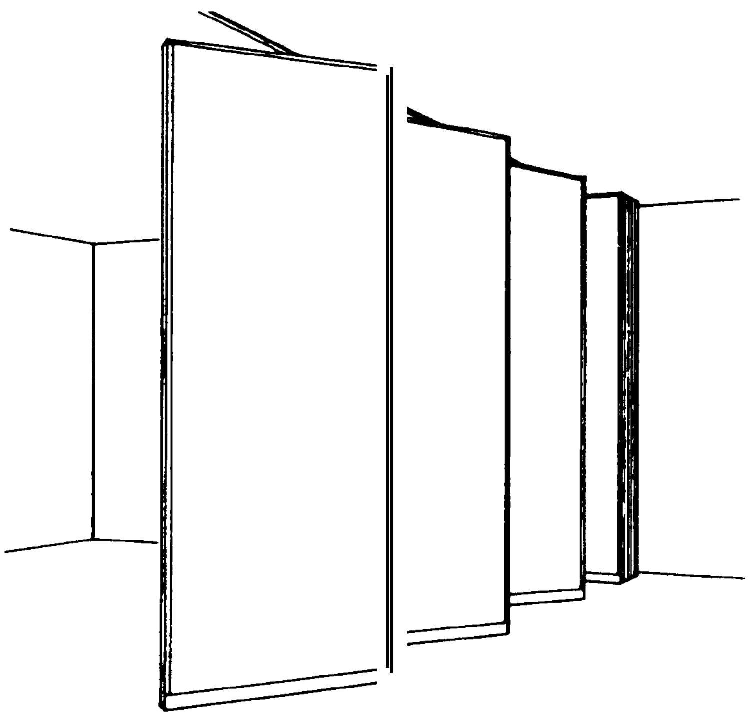


FOLDING LEAF PARTITION

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	MOVABLE PARTITIONS		
PARTITIONS SPECIALTY (CSI 10600)	Revision No.	Issue Date 5/93	Drawing No. A0602-2



RELOCATABLE PARTITION-DEMOUNTABLE AND PORTABLE



OPERABLE PARTITION

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	**MOVABLE PARTITIONS**		
PARTITIONS SPECIALTY **(CSI 10600)**	**Revision No.**	**Issue Date** 5/93	**Drawing No.** A0602-3

DEFICIENCY FACTORS
0.06.02 PARTITIONS SPECIALTY (CSI 10650)

PROBABLE FAILURE POINTS

- Loose connections caused by vibration or improper tightness
- Impact damage caused by striking or impacting the surface
- Loose fitting frames caused by improper attachments, incorrect tough opening, Impact.
- Damaged hardware and operating parts caused by excessive wear, usage, corrosion, and sticking of moveable parts
- Damaged frames caused by impact
- Damaged tracking caused by Improper alignment with door, impact with vehicular traffic such as pedestrian, wheel chair carts, etc.

SYSTEM ASSEMBLIES/DEFICIENCIES

Denting/Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface
Corrosion	Chemical reaction that converts the metal into oxide, carbonate, and sulfides.
Hardware:	Damaged or inoperable hardware and other operating parts.
Broken/Missing Panels:	Impact damage, loose connections, improper movement causing panel to come off track.
Loose Connections:	Caused by impact, vibration, fatigue, or incorrect tightness

DEFICIENCY FACTORS
0.06.02 PARTITIONS SPECIALTY (CSI 106501

END OF SUBSECTION

0.06.03 TOILET PARTITIONS & ACCESSORIES (CSI 10150)

DESCRIPTION

Toilet partitions are manufactured in a variety of materials, finishes, and colors. They are available in various sizes for both regular and handicapped-equipped water closets. These partitions may be custom fabricated. Finish materials include stone, marble, painted metal, plastic laminate, porcelain enamel, and stainless steel. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Toilet Partitions (CSI 10150)

Toilet Partition Mountinqs:

Overhead-braced, floor-mounted partitions are the sturdiest standard installation. Floor-supported partitions are slightly better than floor-mounted units if they are installed at "normal" ceiling heights of 7 feet 6 inches to 8 feet. These units offer unobstructed floor areas for easier maintenance (particularly if used with wall-hung fixtures), but they require structural overhead support framing which is usually field-built. Floor-supported/ceiling-anchored systems are used where vandal resistance is required. Wall-supported partitions, provide a nice appearance, due to the lack of floor and ceiling obstructions, but the necessary supporting framework effectively restricts their application to new construction. Most hardware items (except mounting brackets) are chromium-plated, non-ferrous zinc alloy casting.

Toilet Partitions Finishes:

Baked enamel is the most widely used toilet partition finish. Laminated plastic finishes are generally hard, smooth, and resistant to normal wear, scratching, acids, alkalis, and cigarette burns. It should not be used in high moisture areas due to its lamination. Solid phenolic systems are high density core with abrasion-resistant, high-pressure melamine finish surface. Stainless steel is impervious to most substances, including urine, and it resists denting and marring. Scratches can be removed by machine buffing.

OTHER RELATED COMPONENTS

See the following subsections for related components:

0.06.01.03 Concrete/Masonry 2.1.1-1
0.06.01.03 Drywall/Plaster..... ....2.1.3-l

0.06.03 TOILET PARTITIONS & ACCESSORIES (CSI 10150)

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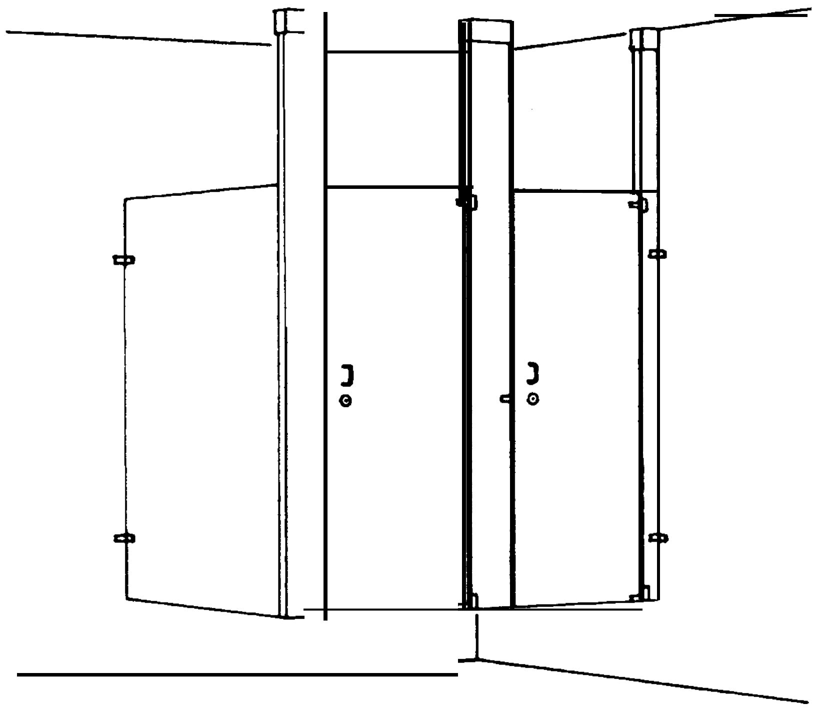
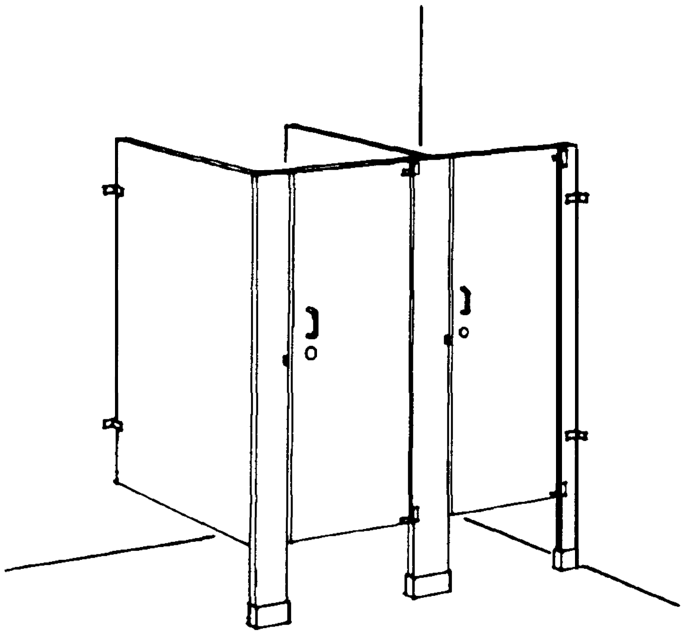


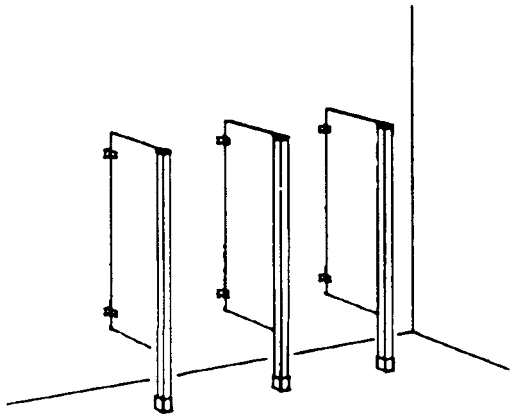
TOILET PARTITIONS-CEILING HUNG

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	TOILET PARTITION TYPES		
TOILET PARTITIONS AND ACCESSORIES (CSI 10150)	Revision No.	Issue Date 5/93	Drawing No. A0603-1

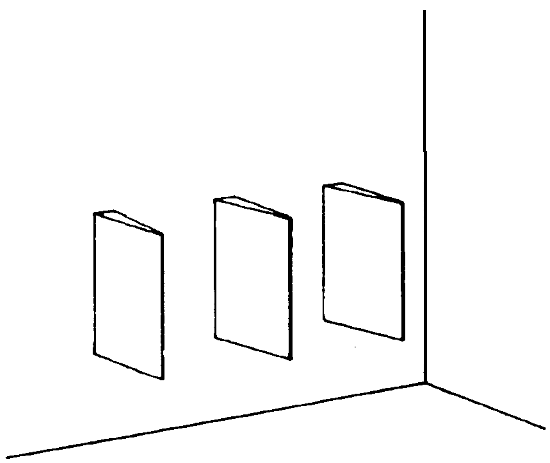


TOILET PARTITIONS-FLOOR MOUNTED

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	TOILET PARTITION TYPES		
TOILET PARTITIONS AND ACCESSORIES (CSI 10150)	Revision No.	Issue Date 5/93	Drawing No. A0603-2

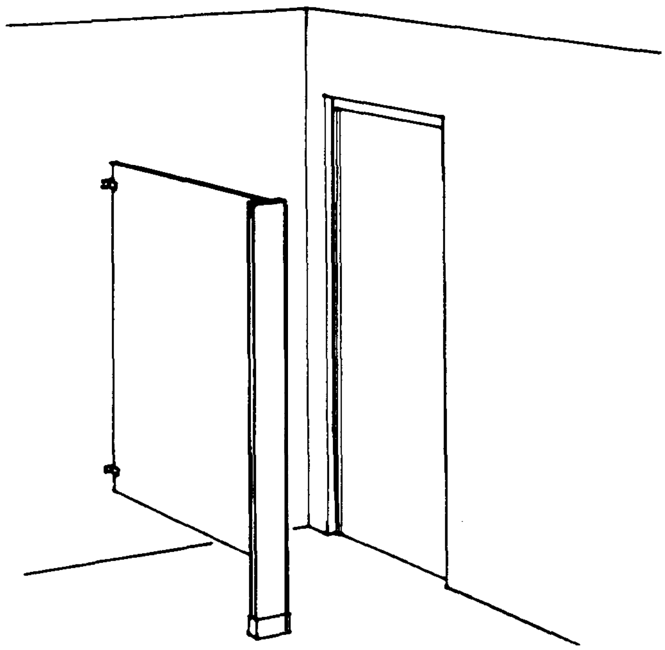


POST BRACED



WEDGE TYPE

SYSTEM' ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**URINAL SCREENS**		
TOILET PARTITIONS AND ACCESSORIES (CSI 10150)	**Revision No.**	**Issue Date** 5/93	**Drawing No.** A0603-3



ENTRANCE SCREEN-FLOOR MOUNTED

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	ENTRANCE SCREENS		
TOILET PARTITIONS AND ACCESSORIES (CSI 10150)	Revision No.	Issue Date 5/93	Drawing No. A0603-4

DEFICIENCY FACTORS
0.06.03 TOILET PARTITIONS & ACCESSORIES (CSI 10800)

PROBABLE FAILURE POINTS

- Loose connections caused by vibration or improper tightness
- Impact damage caused by striking or impacting with the surface
- Loose fitting frames caused by improper attachments, impact damage.
- Damaged hardware and operating parts caused by excessive wear and usage, corrosion, and sticking of moveable operating parts.
- Damaged frames cause by impact.

SYSTEM ASSEMBLIES/DEFICIENCIES

Denting/Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting with the surface.
Corrosion:	Chemical reaction that converts the metal into oxide, carbonate, and sulfides.
Hardware:	Damaged or inoperable hardware and other operating parts.
Broken/Missing Panels:	Caused by impact damage, loose connections, improper movement causing panel door to come off frame and hinges.
Loose Connections:	Caused by impact, vibration, fatigue, or incorrect tightness.

0.06.04 INTERIOR DOORS (CSI 08200)

DESCRIPTION

Both metal and wood doors can serve a variety of functions. They can control passage, provide visual and sound privacy, maintain security, supply fire resistance and weather protection, control light, and serve as radiation shielding. There are three types or major parts and components of a door system: the door itself, the frame, and the hardware. Each must be coordinated with the other components and be appropriate for the circumstances. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Door Frames (CSI 08111)

Door frames may be supplied in 14, 16, or 18-gauge galvanized or plain steel in knockdown standard frames or welded customized frames that can be fabricated to satisfy most design conditions. Frames with borrowed lights, transoms, or cased openings are available in stick components from some manufacturers. Frames may be wraparound (enclosing the wall) butt up against the opening. A wraparound frame may terminate into the enclosed wall when it is covered by a finish such as plaster, or the frame may return along the enclosed wall when it is exposed, such as in drywall construction. They are sometimes supplied in two pieces to suit varied wall thicknesses. Frames are normally reinforced at stress points and are prepared for hinges and strikes. Anchors to attach the frames to the wall are supplied to suit wall construction requirements.

Wood doors frames are made from wood, steel (hollow metal), and aluminum. The decision concerning the type of frame depends on the appearance desired, the type of opening the door is going to be installed, the fire rating requirements, the security needed, and the durability desired. For example, wood frames may be used in 20, 30, and 45-minute fire door assemblies, but a one-hour rated door must be installed in a rated metal frame.

Door Hardware (CSI **08111)**

Pivots or concealed hinges may be conventional butts. Door closers may be concealed instead of surfaced; panel hardware may have concealed rods; and automatic threshold seals can be recessed into door bottoms. Locations for hardware mounting can also be customized. Door edges or frames can be shaped to accommodate any type of weatherstripping. Steel doors can be customized with almost any type of hardware.

Function of Hardware:

- Hanging the door - hinges, pivots, and combination pivots and closers.
- Operating the door - handles, latches, push plates, and pull bars.
- Closing the door - door closers and combination pivots and closers.
- Locking the door - locksets, dead bolts, latch bolts, electric locks, and other special devices.
- Sealing the door - weatherstripping, sound seals, smoke seals.
- Protecting the door - kick plates, corner protection, and similar materials.

Hinges & Pivots:

There are four basic types of hinges: full mortise (butt hinges), half mortise, full surface, and half surface. There are a variety of styles within each type.

Elements or Hinges:

Swagging is a slight offset of the hinge at the barrel that permits the leaves to come together and improves the door operation. A leaf is one of the two attaching plates that when fastened together by the hinge pin, form a complete hinge.

0.06.04 INTERIOR DOORS (CSI 062001

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Door Hardware (CSI 08111)

Elements or Hinges (Continued):

Full mortise is a recess such as one cut into a door stile to receive a hinge. Full surface hinge is a hinge that is installed on the surface of a door and jamb without need of mortising.

Locks:

Locks are one of the most important categories of door hardware. The locks most commonly used in all types of construction are as follows:

- Bored locks are installed in a door having two round holes at right angles to one another, one through the face of the door to hold the lock body, and the other in the edge of the door to receive the latch mechanism. When these two are joined together in the door, they comprise a complete latching or locking mechanism. Bored type locks have the keyway (cylinder) and/or locking device, such as push or turn buttons, in the knobs.
- Preassembled locks are installed in a rectangular notch cut into the door edge; all parts are assembled as a unit at the factory, and when installed, little or no disassembly is required. Preassembled locks have the keyway (cylinder) in the knobs. Locking devices may be in the knob or on the escutcheon.
- Mortise locks are installed in a prepared recess (mortise) in a door. The working mechanism is contained in a rectangular shaped case with appropriate holes into which the required components, cylinder, knob, and turn-piece spindles are inserted to complete the working assembly.

Door Closers:

Door closers control the doors throughout the opening and closing swings by combining three basic components: 1) a power source to close the door (spring); 2) a checking source to control the rate at which the door closes (hydraulic mechanism); and 3) a connecting component (arm) to transmit the closing force from the frame to the door.

Smoke Detectors:

May be photoelectric or ionization types that are connected to magnetic door holder release devices which activate closing mechanisms. Door holder release devices may also be tied into a building fire alarm system in lieu of smoke detectors.

Fire-Rated Doors (CSI 08111)

Underwriters Laboratories (UL) specifies that fire-rated doors must be made of specific materials and designs that have been tested and rated for conformance to fire safety criteria, such as the fire spread rate. UL currently labels steel overhead rolling doors for openings not exceeding a 120 square foot in area, with no dimension exceeding 12 feet. The fire-rated classes are as follows:

0.06.04 INTERIOR DOORS (CSI 06200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Fire-Rated Doors (CSI 081 11) (Continued)

Fire Door Classification

Fire Door Rating (Hours)	Opening Class	Use of Wall	Rating of Wall (Hours)
3	A	fire walls occupancy separations	3 and 4
1 1/2	B	exit stairways vertical shafts fire separations	1
1	B	exit stairways vertical shafts fire separations	1
3/4	C	corridors fire resistive walls hazardous areas	1
1/3		corridors smoke barriers	1 or less
1 1/2	D	severe exterior	2 or more
3/4	E	moderate to light exterior exposure	1 or less

Flush Wood Fire Doors (CSI 08210)

Flush wood fire doors are available with rating labels of "B" 1 1/2 hr., "B" 1 hr., "C" 3/4 hr., 30 min., and 20 min. UL and Warnak Hersey International Inc. (WHI) predominate as the testing and inspecting agencies in providing labeling service for wood door assemblies. Doors are tested as part of an assembly to comply with labeling requirements; each component must be approved for use with components. This places limits on items as the location and types of hardware, methods and materials for fastening hardware to door, size and location of vision panels, sizes of doors, etc.

Wood Doors (CSI 08200)

Wood doors, manufactured in either flush or paneled designs, are separated into three grades: architectural commercial, residential, and decorator. A wide variety of frames are available for exterior installations in metal, pine, or hardwood, and for various partition thicknesses. Some doors are also available prehung for quick installation.- Architectural or commercial wood doors are the type most specified in building construction. The stiles are made of hardwood, and the core is dense and of hot-bonded construction. They feature thick face veneers that are exterior-glued and matched in their grain patterns. Because of its durability, this grade of door often carries a lifetime warranty.

Solid core construction is the recommended type of door for exterior use. The solid core construction is available with either a particleboard core or staved lumber core (wood block). Staved lumber cores are offered with glued blocks or non-glued blocks. The blocks are bonded together, but in the other system the blocks are held together by laminating face panels or crossbands to the core. Depending on which core construction is specified, stiles and rails can be bonded to the core or not. Wood-veneer-faced solid core doors are produced in both 5-ply and 7-ply construction where the core represents one ply and the number of plies in both face panels represent the remaining.

0.06.04 INTERIOR DOORS (CSI 08200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Wood Doors (CSI 08200) (Continued)

Veneer finish for doors is very important. For severe weather conditions exposure or medium-density-overlay (MDO) faced doors should be used. MDO is a resin-treated cellulose fiber sheet that provides a superior surface for paint. Its main advantage is the absence of knots and patches and resistance to grain raising. Some manufacturers may be unwilling to provide a warranty for their exterior doors unless constructed with an MDO face.

Wood Glazed Doors (CSI 08200)

Wood glazed doors include glass within the body of the door for visual purposes. The glazing comes in patterned glass, wire glass, and heat-treated glass. Patterned glass or rolled glass is widely used as decorative obscure glass. Some patterns are available fully tempered to use as safety glass.

Wire glass is a form of rolled glass, with limited choices for glass pattern. Heat-treated glass includes products that have been fully-tempered or heat-strengthened.

Steel Doors (CSI 08110)

Steel doors are available in stock or custom fabrication, flush or embossed, with lights or louvers, labeled or unlabeled, and in various steel gauges and cores fills. Stock doors may be supplied for low-, moderate- or high-frequency of use from some manufacturers. Both hot-rolled and cold-roiled steel are commonly used in fabricating doors, frames, and accessory items. Door faces are made of cold-rolled sheet because it has a smoother surface than hot-rolled and is better suited for forming, welding, and painting. Frames may be made of either hot- or cold-rolled steel, but hot-rolled steel is generally inferior in surface appearance.

Metal doors may be supplied bonded and primed, galvanized and primed, factory-finished in selected colors, or in stainless steel. Doors with lead-lined cores are available, for shielded applications.

Zinc-coated steel sheet is used for improved corrosion resistance. This coating may be applied by hot-dip galvanizing or by electrolytic coating. The term “galvanized” refers only to steel that has been zinc-coated by hot dipping, a process that generally results in superior corrosion resistance. Electronically coated sheets have a thinner zinc coating.

Stainless steel sheets are used for doors and frames where cleanliness and corrosion resistance are important factors, such as kitchens and swimming pool areas. It is used in locations where aesthetic value is of uppermost concern. It is generally used with discretion, due to the higher cost than cold-rolled or galvanized steel.

Sectional Overhead Doors (CSI 08360)

Overhead doors are constructed of single or multiple leaves that are swung up or rolled open from the ground level and assume a horizontal position above the entrance way they serve. Garage doors fall under this category.

Sectional door panels are available in a variety of types: wood, steel, aluminum, fiberglass, steel/fiberglass, steel/aluminum, and aluminum/glazed. Steel panels are stronger and more impact-resistant than the other types.

Aluminum panels are more vulnerable to impact, yet provide a lighter weight door than steel. Wood doors are available with either paneled or flush sections. Fiberglass-reinforced plastic panels in aluminum frames can provide approximately 40 percent light transmission. Also, fiberglass sections can be integrated into the other types of sectional doors.

0.06.04 INTERIOR DOORS (CSI 08200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS (Continued)

Overhead Coiling Door (CSI 08330)

These doors are generally used at exterior openings and can be furnished in widths up to 60 feet in some cases; 24 feet is usually standard. Doors can be operated by chain hoist, crank hoist, or electric motors. Smaller doors (up to 80 square feet) are usually manually push-up operated.

Service door curtain slats are generally available in galvanized steel, aluminum, or stainless steel.

Smoke Detectors:

Smoke detectors may be photoelectric or ionization type that are connected to magnetic door holder release devices which activate closing mechanisms. Door holder release devices may also be tied into a building fire alarm system in lieu of smoke detectors.

Access Doors and Panels (CSI 08305)

Access doors and panels are available to suit almost any type of floor and ceiling construction. They are adaptable to openings in masonry, concrete, gypsum drywall, plaster, and acoustical ceilings. The standard products are intended to be unobtrusive and are either designed to be installed flush with adjacent surfaces and painted to match, or can be recessed with provision for surface to match adjacent material. Most manufacturers can provide special features such as glass panels, louvers, and brass name plates.

Access panels and doors are available in steel or stainless steel for fire-rated or non fire-rated applications. Panels are fabricated for flush installations in drywall, both skim coated or taped, for masonry and tile applications, for plastered walls and ceilings, and for acoustical ceilings. Doors are available is stock sizes and types to suit most applications

Cold-Storage Doors (CSI 08325)

Cold storage doors are available in standard designs in wood, steel, fiberglass, plastic, and stainless steel for all types of cold-storage requirements. Doors are manufactured to provide insulation requirements for cool zones, coolers, and freezers for manual, air, electric, or hydraulic operations. Door operation types include sliding, vertical lift, bi-parting overhead, and single- and double-swing.

Darkroom (CSI 08382)

Darkroom revolving doors and pass-through are modeled to fit an existing doorframe. They provide protection for multiple darkroom installation.

Automatic Doors (CSI 08480)

Automatic doors were developed to provide easy operation of entrance doors for people encumbered in some manner and to control the amount of time the door was open. The door operation begins when the control system is activated by someone stepping on a pressure-sensitive floor mat, passing in front of a motion sensor, or pressing a button or switch. Typical application includes : hospitals, nursing homes, and other facilities where heavy traffic is a regular occurrence.

Sliding Doors (CSI 08312)

Sliding doors are usually framed with aluminum extrusions, although a few companies produce them in steel and wood. The greater emphasis has been placed on weathering qualities of the doors to meet the more severe requirements of colder climates. Originally used only in houses, they are now found in apartments, hotels, institutions, and commercial buildings. The specifications set standards for materials, finish, and hardware and establish performance requirements and test procedures pertaining to strength, weather resistance, and operation.

0.06.04 INTERIOR DOORS (CSI 08200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Sliding Doors (CSI 08312) (Continued)

Door sizes are based on panel unit sizes and combinations of panels. The stock types of doors include two, three, and four panels, some stationary and others movable. For the most part, only one track is used, but some custom multiple sliding door installations use three or four tracks. Sizes are limited in height by the frame section used and in width by standard sizes of double-insulating glass. For single glazing, the size is limited by the thickness of the glass and the design wind load for the locality.

Aluminum Sliding Glass Doors & Sliding Panels - Mall Front (CSI 0831 1)

Aluminum's principal advantages over wood and steel lie in the fact that it is extrudable, lightweight, non-rusting, non-rotting, decorative, and relatively maintenance-free. Because it can be extruded, aluminum can be easily formed into complex sections to achieve desirable weathering and operating goals efficiently. Tracks, drips, baffles, and grooves for sealants and weatherstripping can all be easily obtained, and aluminum forms its own protection as it oxidizes.

Mall fronts and sliding panels are generally located in office buildings. They are available in either single or multiple-door configurations to meet a wide variety of design requirements. Mall fronts and sliding panel systems are fabricated with full top and bottom rails only, and automatic opening mechanisms are available if deemed necessary.

Wood Sliding Glass Doors (CSI 08312)

The chief advantage of wood over aluminum is its superior insulation quality. However, the increased use of thermal-break construction in the aluminum industry has largely erased that advantage. Wood also has a low coefficient of thermal expansion; however, this advantage is largely offset by moisture content. Wood's distinct advantage over aluminum is its aesthetic appeal.

Finish.

The AAMA specifications require that all sliding doors and frames have a protective coating. The minimum coating is a clear lacquer intended principally for protection during construction. The better classes of doors usually have an anodized finish. Some manufacturers offer an epoxy coating in a wide range of colors. This coating has been tested and reported to be durable and impact and chip-resistant.

Glazing:

Sliding doors are usually glazed by the installer, although some companies offer preglazed sash. Glass must be of the safety type meeting, the requirements of ANSI. The panels may be obtained for either single or double glazing; formed vinyl glazing strips or channels are generally used rather than glazing compounds. The aluminum glazing bead, if used, may be snap-on or screwed in place.

Rolling Doors (CSI 08330)

Rolling service doors are generally used at exterior openings and also can be used in interior application. They are furnished in widths up to 60 feet from some manufacturers. In general, door sizes are standard up to 24 feet widths, Doors can be operated by chain hoist or electric motors. Smaller doors (up to 80 square feet) are usually manually push-up operated.

The standard construction of rolling doors is based on an exterior windloading of 20 psf (85 mph). Service rolling door curtain slats are generally available in galvanized steel, aluminum, or stainless steel. Slats can also be manufactured in aluminum, steel, and bronze curtains slats.

Watertight installed rolling doors generally have flat-face slats and additional weatherstripping.

0.06.04 INTERIOR DOORS (CSI 08200)

OTHER RELATED COMPONENTS

See the following subsection for related components:

0.06.04 INTERIOR DOORS (CSI 08200)

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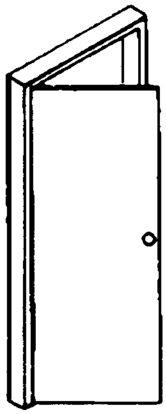
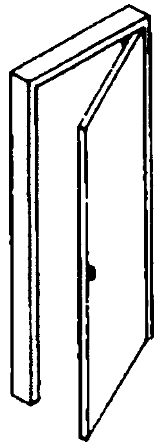
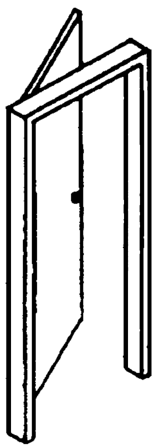


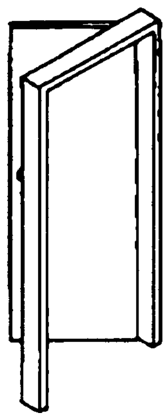
LEFT HAND REVERSE



RIGHT HANDRMRSE

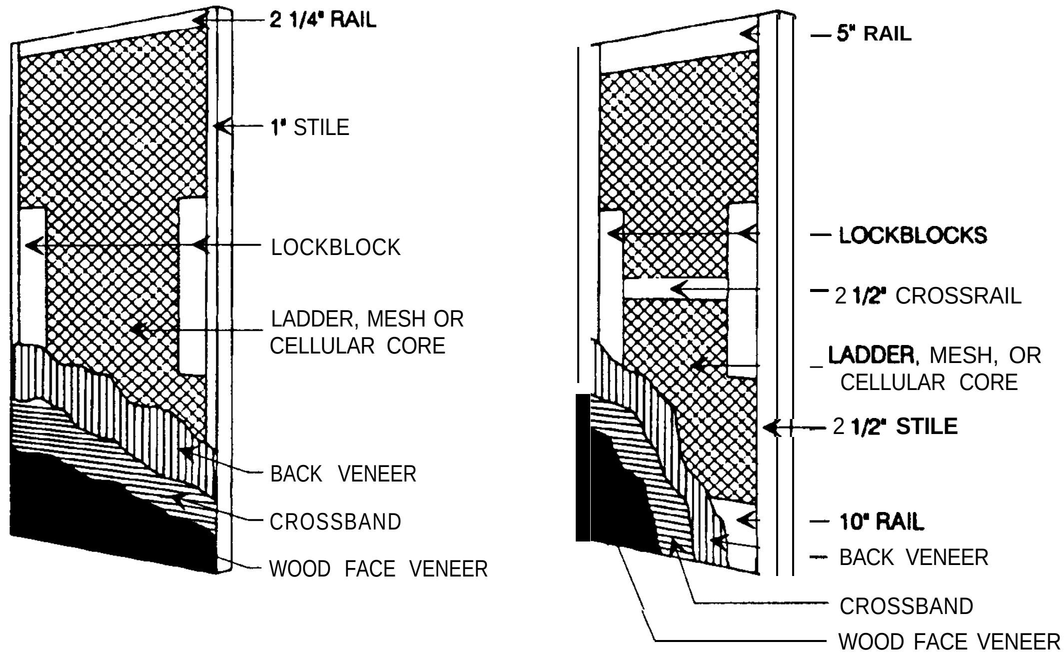


LEFT HAND



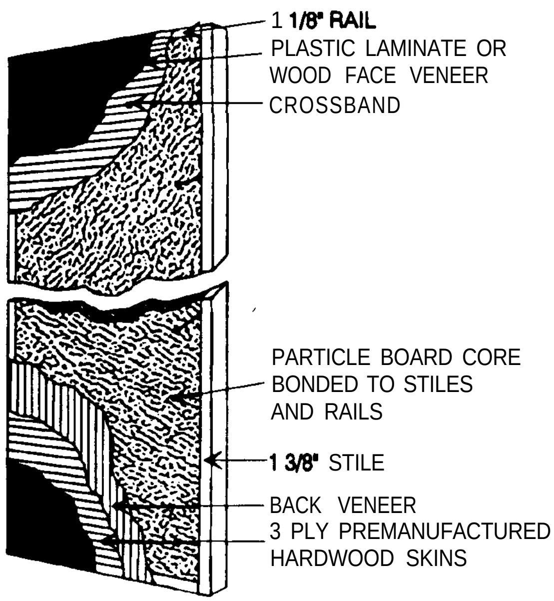
RIGHT HAND

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	HAND DESIGNATIONS		
INTERIOR DOORS (CSI 08250)	Revision No.	Issue Date 5/93	Drawing No. A0604-1

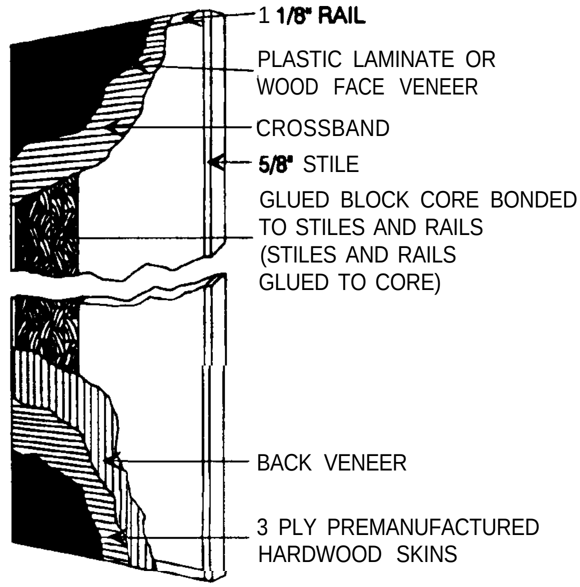


SHC IHC

HOLLOW CORE DOORS



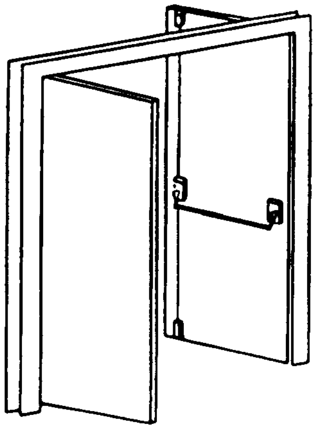
PARTICLE CORE DOOR



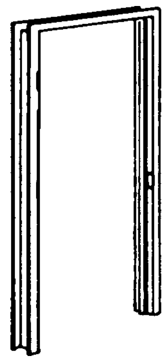
STAVE CORE DOOR

SOURCE: AWI, Architectural Woodwork Institute

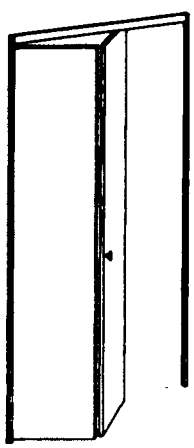
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	WOOD DOORS		
INTERIOR DOORS (CSI 08210)	Revision No.	Issue Date 5/93	Drawing No. A0604-2



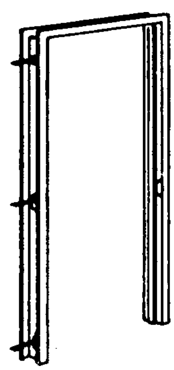
DOUBLE EGRESS DOOR AND FRAME



HOLLOW METAL FRAME-BUTT OR WRAPAROUND

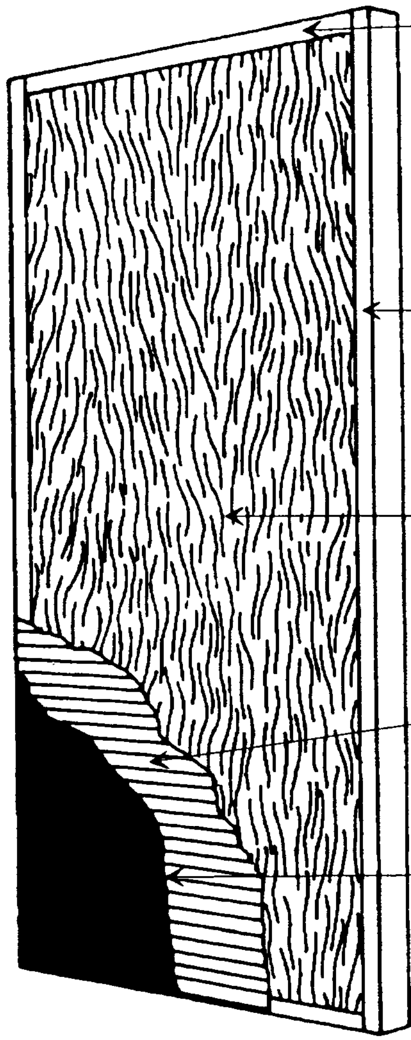


BI-FOLDING CLOSET DOOR AND FRAME



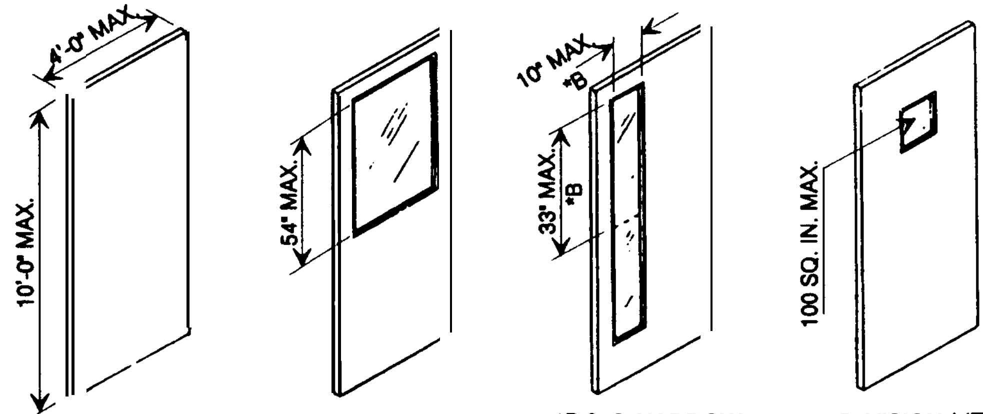
HOLLOW METAL FRAME WITH ANCHORS

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	METAL DOORS & FRAMES		
INTERIOR DOORS (CSI 08100)	Revision No.	Issue Date 5/93	Drawing No. A0604-3



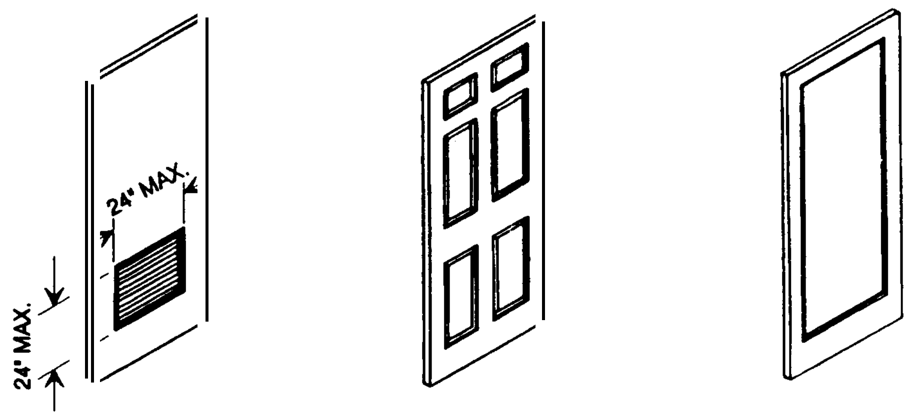
SOURCE: AWI, Architectural Woodwork Institute

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	FIRE RATED WOOD DOOR		
INTERIOR DOORS (CSI 08200)	Revision No.	Issue Date 5/93	Drawing No. A0604-4



A & B FLUSH C HALF GLASS *B & C NARROW B VISION LITE

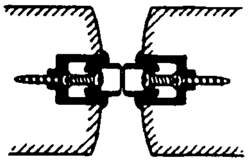
FIRE RATING (U.L. APPROVED)
CLASS A = 3 HR.
CLASS B = 1 1/2 HR.
CLASS C = 3/4 HR.
• RATING DEPENDS ON ACTUAL SIZE OF GLASS



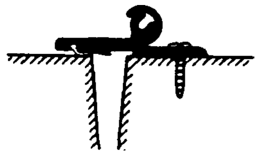
B & C BOTTOM LOUVER B & C EMBOSSED FULL GLASS

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

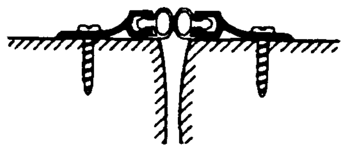
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	FIRE RATED METAL DOORS		
INTERIOR DOORS (CSI 08100)	Revision No.	Issue Date 5/93	Drawing No. A0604-5



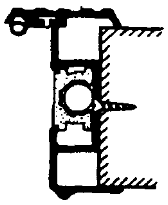
TWO PIECE ADJUSTABLE



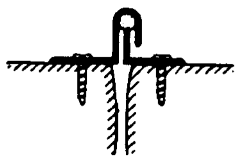
SPRING HINGED SECURITY SEAL



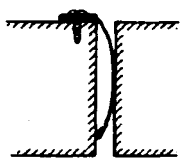
TWO PIECE OVERLAPPING



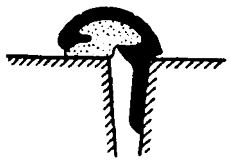
SPRING LOADED LOCKING BOLT



INTERLOCKING WITH BULB INSERT



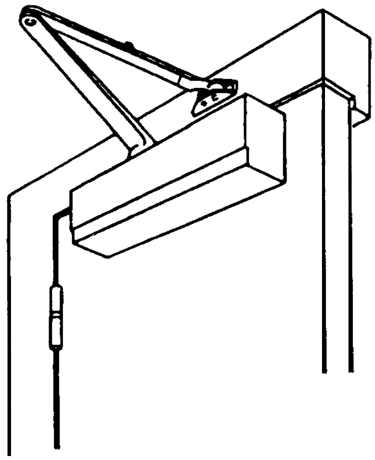
SPRING BRONZE STRIP



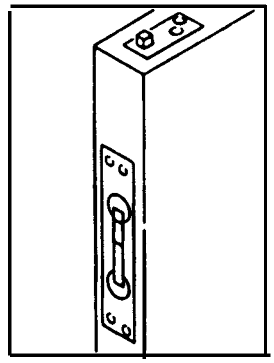
ALUMINUM EXTRUSION WITH SPONGE INSERT

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

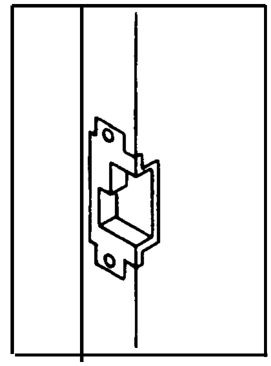
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	FINISH HARDWARE-ASTRAGALS		
INTERIOR DOORS (CSI 08710)	Revision No.	Issue Date 5/93	Drawing No. A0604-6



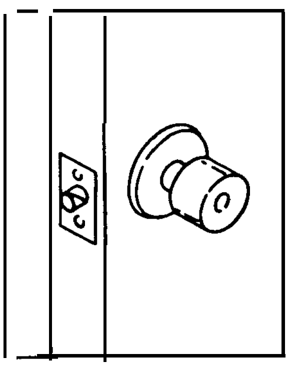
DOOR CLOSER



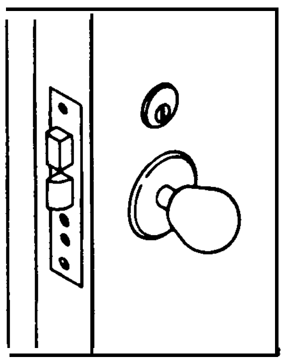
FLUSH BOLT, CONCEALED



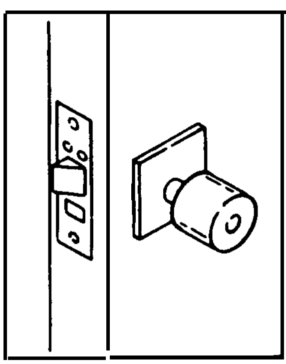
OPEN BACK STRIKE



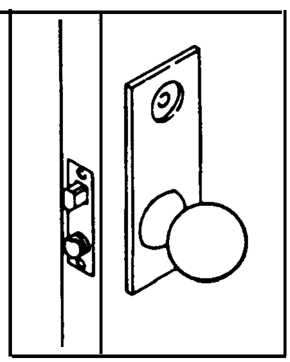
CYLINDRICAL LOCK



MORTISE LOCK

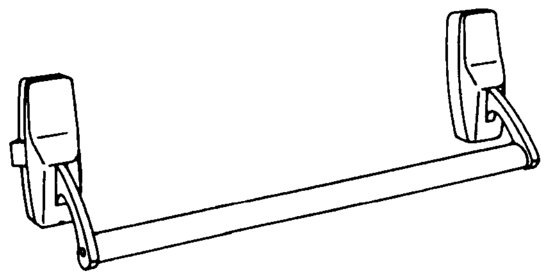


INTEGRAL LOCK

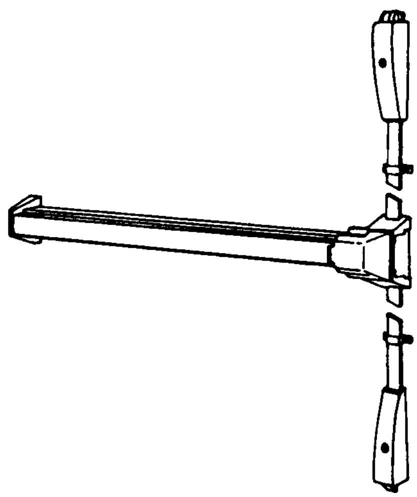


'G' LOCK

LOCKSETS



RIM MOUNTED PANIC BAR

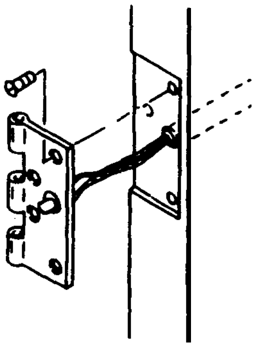


TOUCH BAR AND VERTICAL ROD

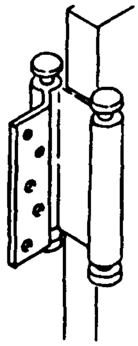
PANIC DEVICES

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

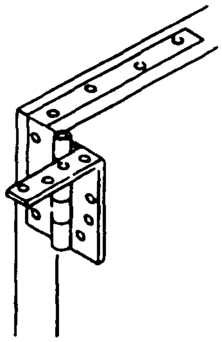
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	DOOR HARDWARE		
INTERIOR DOORS (CSI 08710)	Revision No.	Issue Date 5/93	Drawing NO. A0604-7



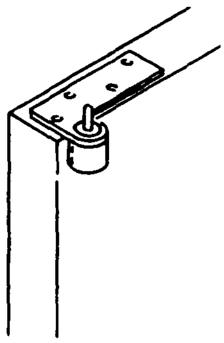
ELECTRIC HINGE



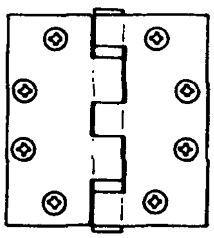
DOUBLE ACTING SPRING HINGE



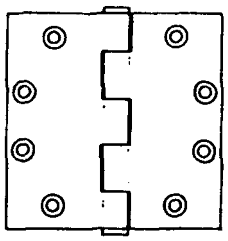
ANCHOR HINGE



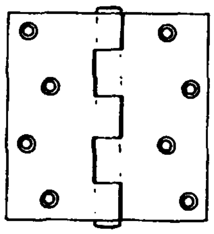
PIVOT HINGE



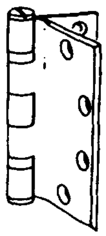
FULL MORTICE HIGH FREQUENCY HINGE



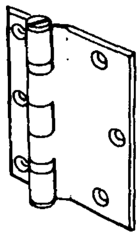
FULL MORTICE LOW FRQUENCY HINGE



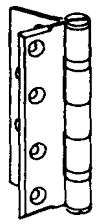
NON TEMPLATE-FULL MORTICE



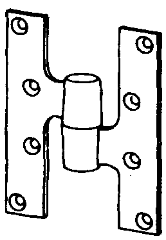
HALF SURFACE



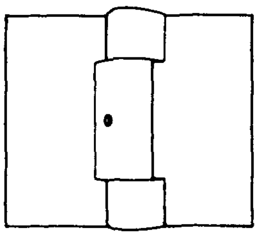
FULL SURFACE



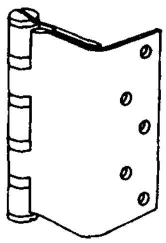
HALF MORTICE



PAUMELLE-BRONZE BASE



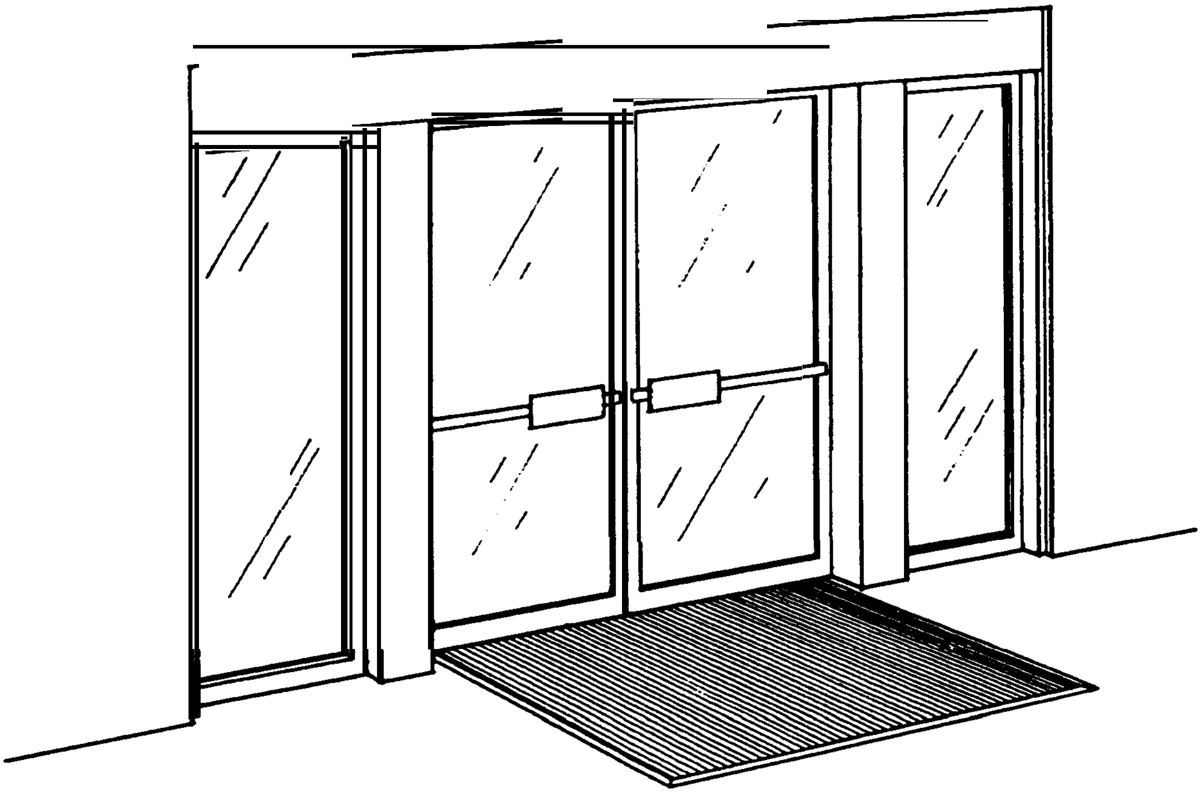
DOUBLE WEIGHT WITH REMOVABLE PIN



SWING CLEAR-HALF MORTICE

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

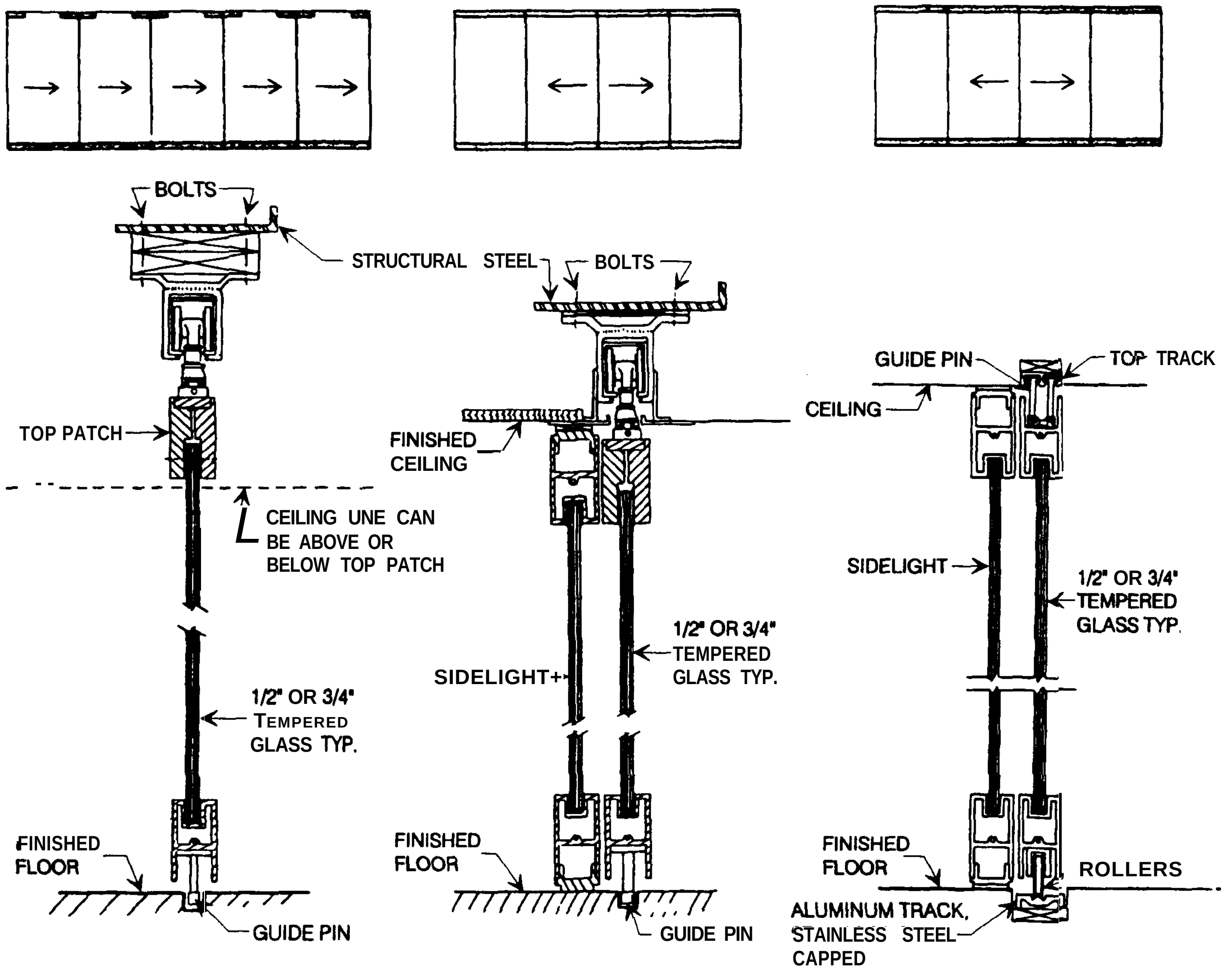
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	DOOR HARDWARE		
INTERIOR DOORS (CSI 08710)	Revision No.	Issue Date 5/93	Drawing No. A0604-8



SLIDING, AUTOMATIC, MALL ENTRANCE DOOR

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	SLIDING ENTRANCE DOORS		
INTERIOR DOORS (CSI 08460)	Revision No.	Issue Date 5/93	Drawing No. A0604-9



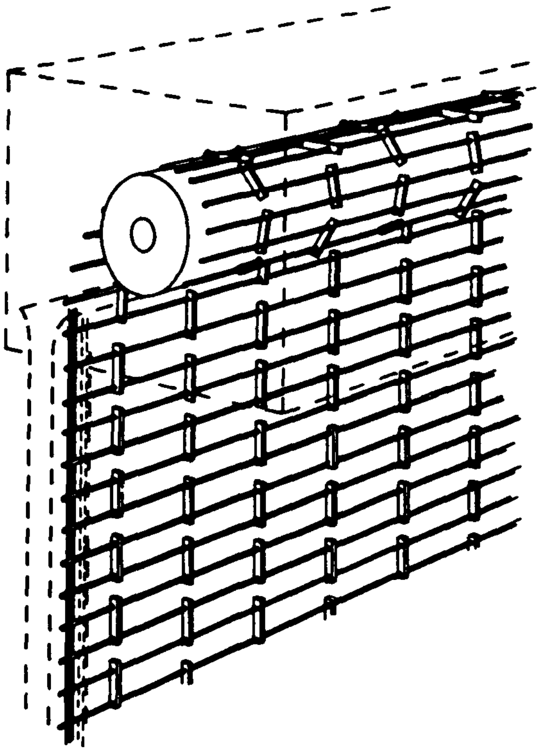
STACKING TOP HUNG SLIDER

BI-PARTING SLIDING DOORS

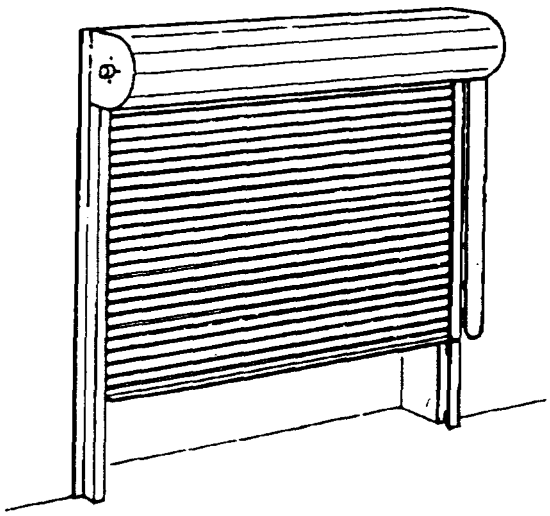
BI-PARTING BOTTOM ROLLER

SOURCE: Falconer Glass Industries

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	SLIDING DOOR PANELS MALL FRONT)		
INTERIOR DOORS (CSI 08490)	Revision No.	Issue Date 5/93	Drawing No. A0604-10

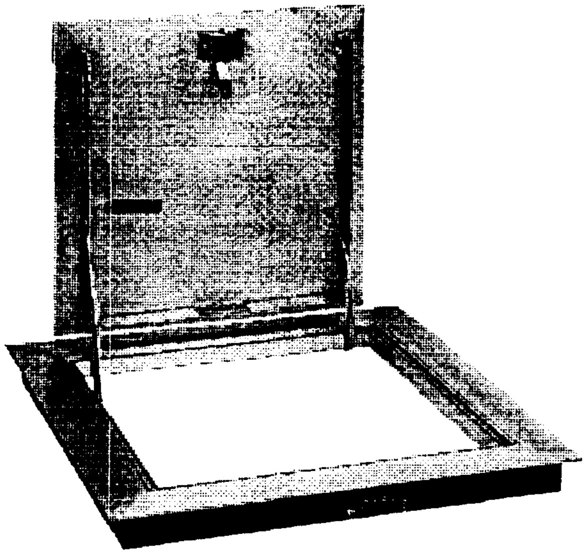


ROLL UP GATE

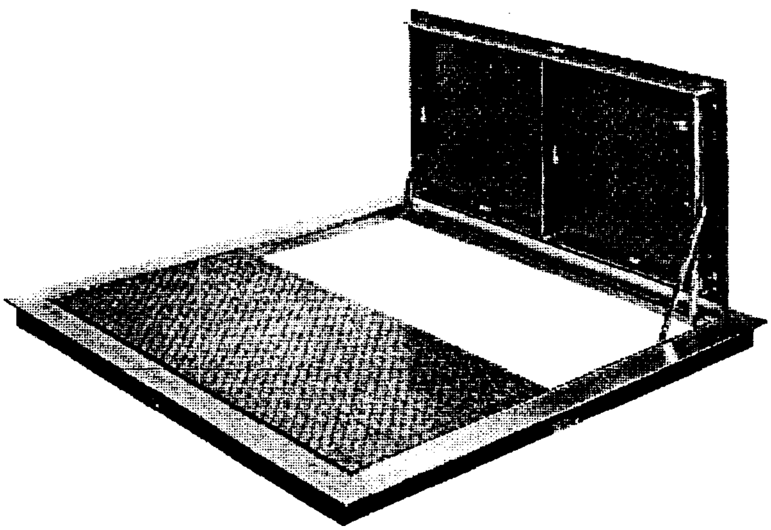


ROLL UP SHUTTER

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

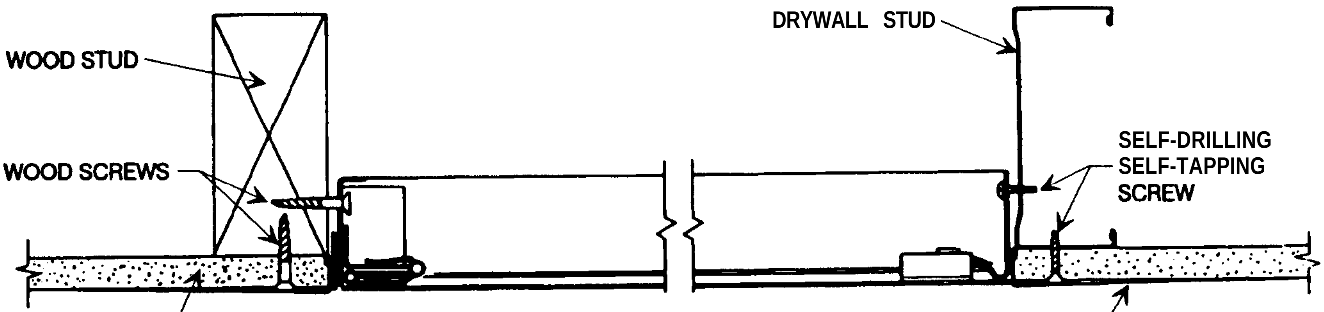


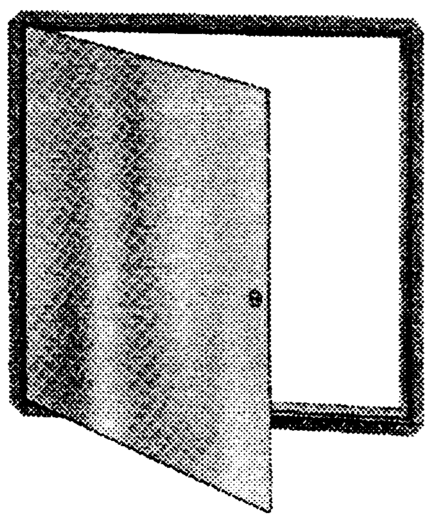
SINGLE ALUMINUM LEAF FLOOR DOOR



DOUBLE ALUMINUM LEAF FLOOR DOOR

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	SPECIAL DOORS (ACCESS)		
INTERIOR DOORS (CSI 08305)	Revision No.	Issue Date 5/93	Drawing No. A0604-12





FLUSH PANEL ACCESS DOOR FOR DRYWALL

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	SPECIAL DOORS (ACCESS)		
INTERIOR DOORS (CSI 08305)	Revision No.	Issue Date 5/93	Drawing No. A0604-13

DEFICIENCY FACTORS
0.06.04 INTERIOR DOORS (CSI 08200)

PROBABLE FAILURE POINTS

- Damaged tracking, causing door to become inoperable.
- Door jumping off tracking caused by impact, improper alignment with tracking, damage to tracking.
- Faulty hardware caused by excessive usage, jamed lock devices, hardware corrosion.
- Impact damages caused by object striking or impacting the surface.
- Termite and boring insect damage causing breakdown of structural integrity.
- Decay (rot) due to fungi, mildew, dry rot causing surface deterioration.
- Fire damage or charred surfaces causing flaking or surface breakdown.
- Loose connections caused by vibration, temperature changes, or improper tightness.
- Splitting or checking caused by stress, bending, or twisting.
- Cracking caused by stress, settlement/movement, poor materials, or improper construction.
- Impact damage caused by objects striking or impacting the surface.

SYSTEM ASSEMBLIES/DEFICIENCIES

Dry Rot/Decay:	Breakdown of structural integrity from mold/mildew or dry rot.
Loss of Protective Coating/Paint:	Chalking, peeling, chipping, blistering, or deterioration.
Splitting:	Surface splitting or tearing.
Insect Damage:	Holes, cracks, or punctures from burrowing insects.
Burned or Charred Surface:	Damage from fire or excessive heat on surface.
Loose Connections:	Impact, vibration, fatigue loading, or incorrect tightness.
Damaged Welds:	Cracked or broken welds caused by stresses, poor materials, or improper construction.
Missing/Faulty Hardware:	Misuse, excessive wear/tear, problems with operable motors.
Glass Breakage:	Abuse, faulty closer causing door to close too fast.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the door surface.

DEFICIENCY FACTORS
0.06.04 INTERIOR DOORS (CSI 08200)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	WATER DAMAGED WOOD DOOR		
INTERIOR DOORS (CSI 08210)	Revision No.	Issue Date 5/93	Drawing No. D0604-1

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	RUSTED METAL DOOR FRAME		
INTERIOR DOORS (CSI 08110)	Revision No.	Issue Date 5/93	Drawing No. D0604-2

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	MISSING DOOR HARDWARE		
INTERIOR DOORS (CSI 08210)	Revision No.	Issue Date 5/93	Drawing No. D0604-3

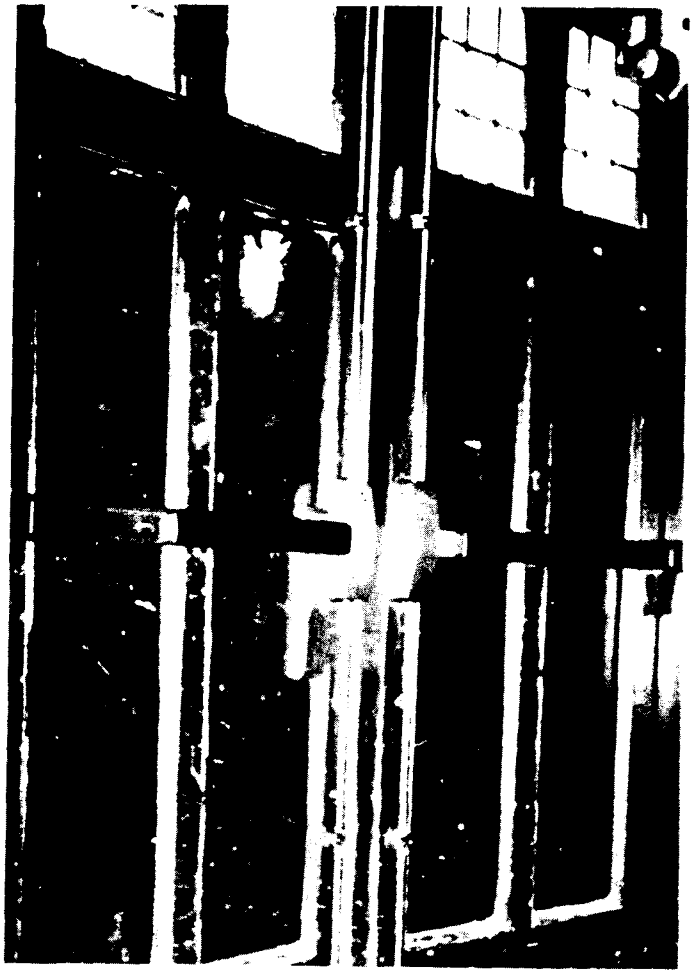

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	DAMAGED WOOD DOOR		
INTERIOR DOORS (CSI 08210)	Revision No.	Issue Date 5/93	Drawing No. D0604-4

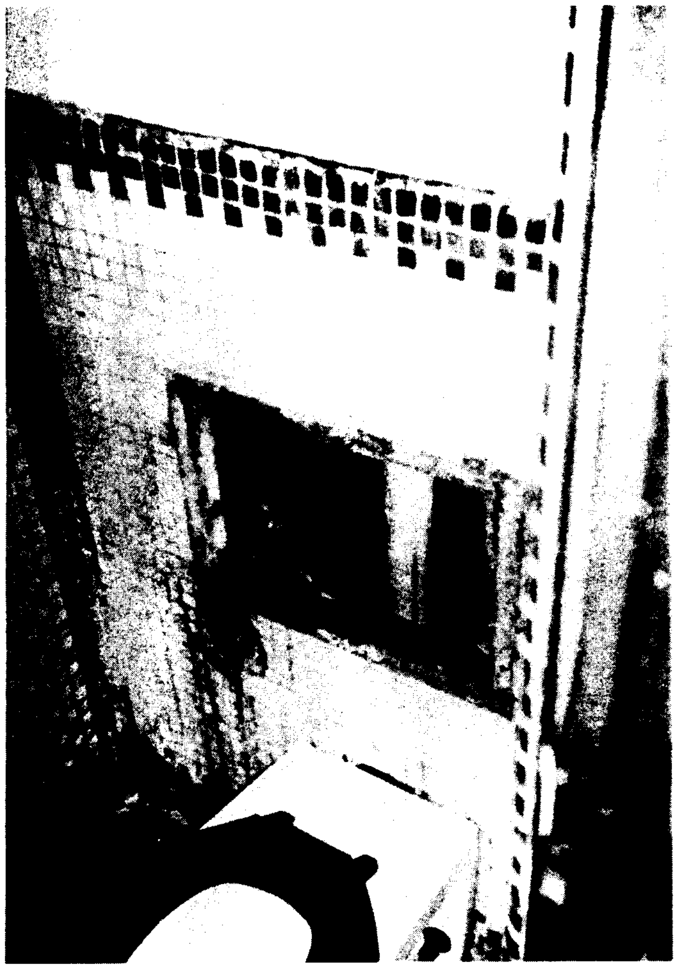

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	RUSTING FRAME/MISSING ACCESS DOOR		
INTERIOR DOORS (CSI 08305)	Revision No.	Issue Date 5/93	Drawing No. D0604-5

DEFICIENCY FACTORS
0.06.04 INTERIOR DOORS (CSI 08200)

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DEFICIENCY FACTORS
0.06.04 INTERIOR DOORS **(CSI** 08200)

END OF SUBSECTION

DEFICIENCY FACTORS
0.06.03 TOILET PARTITIONS & ACCESSORIES (CSI 10800)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	RUSTING TOILET PARTITION		
TOILET PARTITIONS (CSI 10810)	Revision No.	Issue Date 5/93	Drawing No. D0603-1

DEFICIENCY FACTORS
0.06.03 TOILET PARTITIONS & ACCESSORIES (CSI 10800)

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DEFICIENCY FACTORS
0.06.03 TOILET PARTITIONS & ACCESSORIES (CSI 10800)

END OF SUBSECTION

0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

DESCRIPTION

Paint is a combination of chemicals, each imparts specific qualities to the coating or serves a particular function during curing or application. Paint manufacturers blend these ingredients in various combinations and different proportions to produce the specific qualities desired in the finished product. It is possible for the manufacturers to provide different products that will perform similar tasks but with different formulations. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Conventional Paints (CSI 09900)

Paints are divided into four parts: vehicles, solvents, pigments, and additives.

- Vehicles carry the film-forming ingredients to the surface to be coated. The vehicle contains the film-former or binder, which gives the paint film continuity and provides adhesion to the substrate. Most paints are described by the type of binder (alkyd, latex, urethane, etc.) that is either dissolved in a solvent or emulsified in water. The binder may be a drying oil, a dry resin, a plasticizer, or a combination of these elements. The performance characteristics of the coating depends primarily on the type of binder used.
- Solvents are low-viscosity, volatile liquids that improve coating application properties. Most liquid coatings cannot be applied without these solvents, which perform several important functions. First, solvents dissolve the film-former in solution-type coatings or separate film-former droplets in emulsion coatings. Second, they reduce the solution to the proper viscosity for good application by controlling the time necessary for paint set-up. Solvents are usually one or two types: hydrocarbon or oxygenated. A third type, turpentine, usually containing turpentine or pine oil, is seldom used today. Hydrocarbon solvents contain only hydrogen and carbon atoms in their molecules. Hydrocarbon solvents contain oxygen atoms in addition to hydrogen and carbon atoms.
- Pigments are solid grains or particles of uniform size that are permanently insoluble in the vehicle and provide the opacity, gloss, and color characteristics of the paint film. They protect the substrate by providing resistance to corrosion, weather, and abrasion; they also protect from fading due to exposure to light or other conditions. Pigments also contribute hardness and improved adhesion to the coatings and are useful in filling in the space.
  - High-gloss paints or enamels contain little if any extender pigments and produce maximum washability and durability. They are most often used on trim and moldings. Excessive use of high-gloss materials on large surfaces, such as walls or ceilings, can lead to eye strain. They are often used for sanitary purposes because the hard, smooth surface discourages a dirt and bacteria and is easier to clean.
  - Semi-gloss paints and enamels contain less film former and more pigment than high-gloss materials and are a compromise between the appearance of a flat finish and the performance of high gloss. They are most often used on trim, moldings, and interior doors. They are also used on larger surfaces, such as walls and ceilings, where a high degree of cleanliness is necessary.

0.06.05.01 CONVENTIONAL PAINTS (CSI 099001

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Conventional Paints (CSI 09900) (Contrnued)

- Additives are ingredients in the paint that modify properties of the vehicle, or pigments, or both. Many binders, such as vinyl chloride resins, would not work without the added plasticizers to increase flexibility and adhesion of the film formers. Some additives also improve paint formula properties, such as adjusting drying speed, increasing abrasion resistance, or making the material easier to apply. Air dryers added to oil-based paints speed drying time. Certain additives serve as catalysts for oxidizing binders; Other types include wetting agents, anti-setting or anti-skinning agents, ultraviolet-screening agents, fungicides, and preservatives.

Latex (CSI 09900)

Latex paints are classified as binders or vehicles. Latex binders include polyvinyl acetate, acrylics, or vinyl acetate-acrylics and binders mixed with a water base.

Latex paints are based on aqueous emulsions of three base polymers: polyvinyl acetate (PVA), polyactylic, and polystyrene-butadiene. They dry by water evaporation, followed by coalescence of the polymer particles to form tough, insulable films. They have little odor, are easy to apply, and dry rapidly. Exterior latex paints are applied over concrete, masonry, plaster, or over-primed wood surfaces. They are non-flammable, economical, and have good color retention over a wide range of colors.

Alkyds/Enamels (CSI 09900)

Paints can normally be classified by their binders or vehicles. Alkyds are oil-modified resins used to manufacture fast-drying enamels. Silicone alkyd binders are oil-modified to produce coatings.

Silicone/Alkyd (CSI 09900)

Combinations provide an expensive but extremely durable coating for use on smooth metal. They are highly weather-resistant and have an excellent color and gloss retention when used over exterior ferrous metal.

Vinyl/Alkyd (CSI 09900)

Resins offer a compromise between the excellent durability and resistance of vinyls with the lower cost, higher film build, ease of handling, and adhesion of alkyds. The vinyl-alkyd combination is excellent when used over structural steel in marine and moderately severe corrosive environments.

They are available as clear or pigmented coatings in a wide range of colors and in flat, semi-gloss, and high-gloss finishes. They are easy to apply and may be used over most surfaces, except alkaline types such as fresh concrete, masonry, or plaster. They provide good color and gloss retention in exterior applications where not to exposed to corrosive environments. Alkyds are the most common enamels in general use.

Enamel is fast drying and levels out easily to a smooth, hard finish with sheen. It has a higher percentage of liquid binder than paint and is more durable. Enamel is usually used only on small areas or very smooth substrates.

0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS (Continued)

Oil Paints (CSI 09900)

Paints can normally be classified by their binders or vehicles. Oil paints consist of linseed oil as the binder, although other oils have been used. Oil-based paints are used primarily on exterior wood and metal because they dry too slowly for interior use and are sensitive to alkaline masonry. Linseed oil provides good surface wetting so these paints can be used on metal that has been only hand-cleaned. They are not hard or resistant to abrasion, chemicals, or strong solvents; however, in normal environments, they provide a very durable coating. Oil-based primers are excellent over hand-cleaned steel surfaces.

Oil-Alkyd Combination Binders:

These consist of linseed-oil binders modified with alkyd resins to reduce drying time, improve hardness and gloss retention, and reduce fading. They are usually used on exterior windows and doors that require these qualities. Oil-alkyds are also often used as primers on structural steel when faster drying finishes are required. When used on structural steel, better surface preparation is required than for straight oil paints.

OTHER RELATED COMPONENTS

Refer to applicable sections for all assemblies and components used as substrate for paints/coatings for additional deficiencies that may impact this system.

See tables relating to paint and special coatings in subsection 1.7 of this volume.

0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

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DEFICIENCY FACTORS
0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

PROBABLE FAILURE POINTS

- Alligatoring - cross-hatch pattern of surface cracking.
- Bubbling on the surface of dried film. May be microscopic.
- Substrate deterioration caused by moisture penetration, corrosion, rotting, decay.
- Lack of prime coating to substrate, (e.g., metal, masonry, gypsum/drywall, concrete, CMU).
- Visible cracks through the surface of the film.
- Paint misapplied for location.

SYSTEM ASSEMBLIES/DEFICIENCIES

Alligatoring:	Incompatibility of topcoat and underfilm, or coating over a soft underfilm.
Bubbling/Blisters:	Rapid solvent volatilization within the film. Air displacement resulting from absorption of wet film into porous substrate.
Cracking:	Stress, compression cracking or rigid substrate. Bending or flexing on non-rigid substrates. Physical damage: impact, heat, cold, exposure, etc.
Soiling:	Exterior dirt and soil.
Chalking:	Paint weathering at the coating surface.
Checking & Cracking:	Temperature change causing the overlaying paint to expand and contract, causing it to become hard and brittle.
Erosion:	As chalking continues, the entire coating wears away or erodes and becomes thinner. Eventually, it becomes too thin to hide the substrate.
Flaking and Peeling:	Moisture gets into a crack and loosens large areas of the coating.

DEFICIENCY FACTORS
0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

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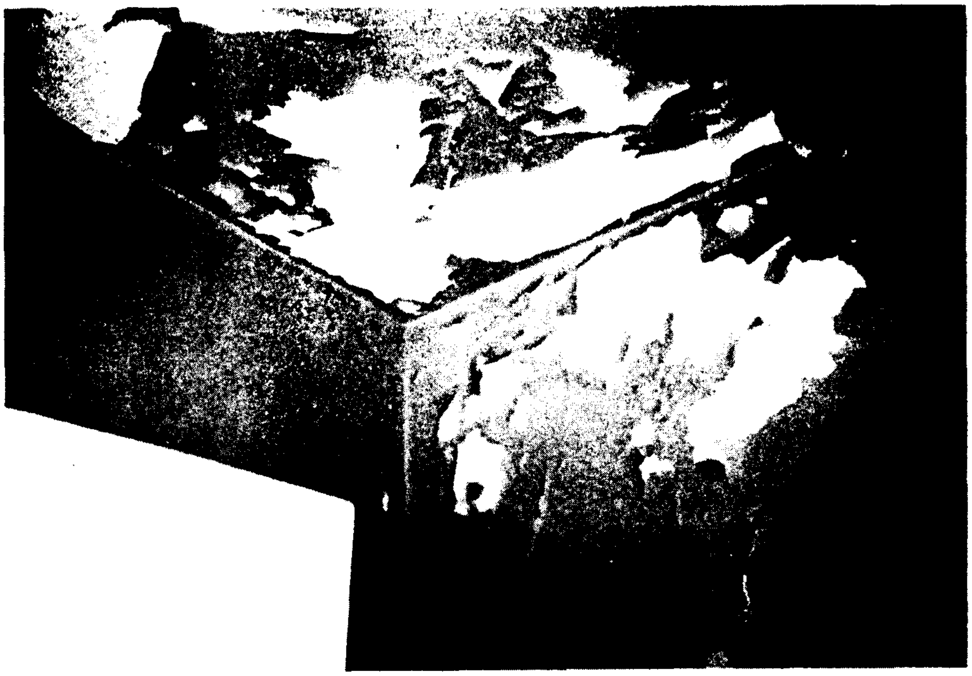

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	PEELING PAINT		
PAINT/FINISHES/COATINGS (CSI 09920)	Revision No.	Issue Date 5/93	Drawing No. D060501-1

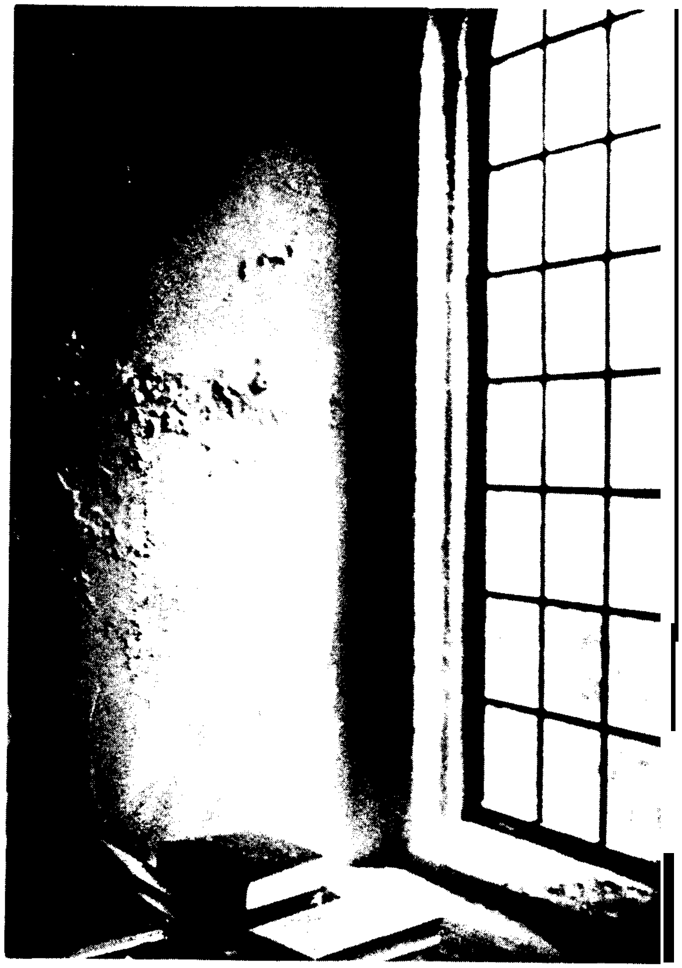

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	MOISTURE CAUSING PAINT BUBBLES		
PAINT/FINISHES/COATINGS (CSI 09920)	Revision No.	Issue Date 5/93	Drawing No. 0060501-2

DEFICIENCY FACTORS
0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

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DEFICIENCY FACTORS
0.06.05.01 CONVENTIONAL PAINTS (CSI 09900)

END OF SUBSECTION

0.06.05.02 SPECIALTY COATINGS (CSI 09900)

DESCRIPTION

Special coatings are coating types and application methods that require more than normal skills and techniques for application. Special coatings include such diverse operations as chemical plants, power generator plants, sewage treatment, and waster treatment plants as well as heavy industry uses. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Vinyls (CSI 0990)

Painting is required to protect interior and exterior surfaces from wear and corrosion and to provide a coordinated finished appearance on the protected material. Paint can normally be classified by their vehicles or binders.

Vinyls, as used in the coatings industry, usually refer to solvent-thinned PVC resins and the copolymers. Lacquers based on modified PVC resins are used on steel where durability under adverse environments is required. Although they are moderate in cost, they are low in solids and require a high degree of surface preparation for bond. Their low solids content requires more coats to achieve adequate dry film thickness. Total cost is higher when compared to most paints due to labor required for additional coats. Strong solvents present an odor problem. Vinyls can be used on metals or masonry but are not recommend for wood. They have excellent resistance to chemicals, corrosive environments, and water, yet are susceptible to strong solvents.

Chlorinated Rubber (CSI 09900)

A single component, thin film gloss finish for use on properly prepared and primed steel, wood, and masonry surfaces. It exhibits excellent flexibility, water, and chemical resistance. It is used as a moisture/vapor barrier over concrete and masonry. It is a chemical, water-resistant coating for marine and chemical processing industries.

Bituminous Coatings (CSI 09900)

Bituminous paints (thin film): The term “bituminous paint” refers to low consistency solutions of coal tar or asphalt without filler or with only a slight amount of filler. They are applied in the same manner as conventional paints and are applied at a coverage where the dry film thickness is recommended by the manufacturer. The expected range of dry film thickness for the bituminous coating is from 1.7 to 3 mils per coat.

Cold-Applied Bituminous Coatina (Medium & Thick Film):

The term refers to high consistency filled solutions of coal tar or asphalt, applied by brushing or spraying. Cold-applied bituminous coating (thick film) refers to very high consistency filled solutions of coal tar or asphalt. The expected range of dry film thickness for the coatings is 12 mils for medium film and 25 mils for thick film. Thick film is also applied by brushing or spraying. If spray-applied, special heavy pump type spray equipment is used.

Bituminous Enamels:

Bituminous enamels are formulated from coal tar pitches or petroleum asphalts and have been widely used as protective coatings for over’65 years. Coal tar comes in two grades: summer and winte. These enamels are the corrosion coating, combined with glass or felt to obtain mechanical strength for handling.

0.06.05.02 SPECIALTY COATINGS (CSI 09900)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS (Continued)

Chemically Cured Coatings (CSI 09900)

Chemically cured coatings are coatings that are either air-dried or heat-cured. Examples of chemically cured coatings include catalyzed epoxies, coal tar epoxies, polyurethanes, and alkyds.

Fire-Retardant Paints (CSI 08848)

Fire-retardant paint is composed of noncombustible substances such as silicones, chlorinated waxes and resins, and antimony oxide used to protect combustible surfaces. Fire-retardant paint inhibits the rapid spread of flames; it is used on unfinished interior wood, acoustical board, insulation board and unfinished wood to reduce flame spread and smoke. There are also fire-retardant paints that have been developed for application to textiles made of natural fibers (e.g., cotton, wood, canvas, silk, and viscose rayon).

Air-Dry Coatings-Catalvzed:

This group of coatings finds widespread use in the industrial maintenance and marine areas, where difficult exposure conditions require coatings with extreme toughness, abrasion resistance, and chemical and corrosion resistance.

Their use is limited in the general industrial area because of their high cost and the requirements accurate measuring and mixing prior to use. There are also losses associated with the "pot life" which is the time the mixed paint remains usable after mixing, sometimes less than eight hours and rarely more than twenty-four. For this reason they are very unsuitable for dipping application.

Heat-Cured Coatings:

Heat cured coatings are commonly referred to as stoving or baking enamels and form, by far, the largest volume group of paints used by the industry. Because an article may be painted, allowed to "flash-off" then cross-linked with heat to produce a completely cured coating having achieved all its film properties within an hour of painting, they are ideally suited to the conveyorised production lines of most industries.

Stoving schedules may vary over very wide range in several types of ovens, and the industrial coatings chemist must be able to tailor the coatings to suit these conditions. Stoving schedules vary from 30 minutes to only a few seconds.

Coatings required to bake at temperatures below 120º are usually referred to as low-bake enamels and are commonly air drying coatings that dry with heat assistance. Low temperatures are sometimes used on materials that are subject to heat distortion, such as timber and some plastics.

Zinc-Rich Painting System (CSI 09900)

Zinc-rich coatings may be used in a variety of environments, but are mainly intended for use in conditions of high humidity or marine atmosphere exposure, both exterior and interior, and for fresh water immersion. With appropriate top coating, they may be used for brackish and sea water immersion and for exposure to chemical fumes.

Zinc-rich coatings are heavily pigmented with metallic zinc to form an electrically conductive coating. Long-term protection is by a barrier mechanism. This is supplemented by galvanic protection from the zinc at scratches or breaks in the paint film. Zinc corrosion products formed in providing this protection tend to block small breaks in the coating to sustain barrier protection.

The zinc-rich paints are not limited to any particular vehicle composition. Depending on the skill of formulation, good results have been obtained with a wide variety of vehicles, including inorganic such as zinc silicates and phosphates, and organics such as epoxies, chlorinated rubbers, and polyesters.

0.06.05.02 SPECIALTY COATINGS (CSI 09900)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Zinc-Rich Painting System (CSI **09900)** (Continued)

Some properties depend on the type of vehicle. However, zinc-filled coatings are unsuitable for acid service without suitable topcoats and their alkali resistance is very limited. The inorganic coatings have outstanding ability to withstand exposure to solvent, oils, and petroleum products.

OTHER RELATED COMPONENTS

Refer to applicable sections for all assemblies and components used as substrate for paints/coatings for additional deficiencies that may impact this system.

See tables relating to paint and special coatings in subsection 1.7 of this volume.

0.06.05.02 SPECIALTY COATINGS (CSI 09900)

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DEFICIENCY FACTORS
0.06.05.02 SPECIALTY COATINGS (CSI 09900)

PROBABLE FAILURE POINTS

- Alligatoring - cross-hatch pattern of surface cracking.
- A change of appearance followed by degradation.
- Surface bubbling of dried film. May be microscopic,
- Substrate deterioration caused by moisture penetration, corrosion, rotting, and decay
- Visible cracks through the film surface.

SYSTEM ASSEMBLIES/DEFICIENCIES

Alligatoring:	Incompatibility of topcoat and underfilm, or coating over a soft underfilm.
Bubbling:	Rapid solvent volatilization within the film. Air displacement resulting from wet film absorption into porous substrate.
Cracking:	Stress or compression cracking or rigid substrate. Bending or flexing on non-rigid substrates. Physical damage: impact, heat, cold, exposure, etc.
Soiling:	Exterior dirt and soil.
Chalking:	Paint weathering at the coating surface.
Checking & Cracking:	Temperature change causing the overlaying paint to expand and contract, causing it to become hard and brittle.
Erosion:	As chalking continues, the entire coating wears away or erodes and becomes thinner. Eventually, it becomes too thin to hide the substrate.
Flaking & Peeling:	Moisture gets into a crack and loosens large areas of the coating.

DEFICIENCY FACTORS

0.06.05.02 SPECIALTY COATINGS (CSI 09900)

END OF SUBSECTION

0.06.05.03 FINISHES (CSI 09900)

DESCRIPTION

Finishes for wood and other substrates include stains and varnish, which are normally applied by brush, roller, or spray gun. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Varnishes (CSI 09900)

Varnishes are homogenous mixtures of resins, drying oils, dryers, and solvents. They dry by a combination of evaporation, oxidation, and polymerization to give a transparent or translucent film that allows the substrate to show through.

Although exterior varnishes are not recommended as long-lasting exterior finishes, they are still used in many applications. The most durable varnishes for exterior exposure are combinations of tung oil with 100 percent phenolic resin. Phenolics, as a group, yield varnishes of dark color. Resin-modified phenolic resins form varnishes with good water and alkali resistance, but exterior durability requires a long-oil type resin.

Clear Sealers:

Clear sealers are varnishes thinned with solvents to penetrate and seal the substrate rather than form a film. Sealers are used to prevent grain raising in wood and to seal porous plywood surfaces before painting.

Flat Varnish:

Flat varnish is made by adding transparent flatting pigments, such as synthetic silica, to the resin to provide a lower gloss. Varnishes normally dry to a high gloss. Flat varnish dries to a low gloss, transparent finish.

Polyurethanes (CSI 09900)

Polyurethanes normally require chemical pretreatment of the substrate, or a primer, such as two-pack etch primer or two-pack epoxy primer.

Two-pack polyurethanes exhibit toughness, abrasion resistance, flexibility, and good chemical resistance. They also have good resistance to weathering.

The two-pack polyurethanes use the isocyanate reaction, whereby a polymer containing hydroxyl groups is cross-linked with a polyisocyanate. Any resin containing hydroxyl groups can be reacted in this way; the list includes alkyds and castor oil.

They find wide usage in industrial maintenance finishes for their good chemical resistance. They are widely used in the general industrial area, where they give long service on aluminum window frames, metal, and timber. They are also used as a finish coat over epoxy primers and are of major importance for painting commercial and military aircraft, marine craft, trucks, buses, and similar products.

Stains (CSI 09900)

Stains are pigmented compositions that change the color of a surface. The term primarily refers to products used on wood surfaces. They protect by penetrating the surface and leave practically no surface film. The industry also classifies bleaching agents and clear, unpigmented materials as stains.

0.06.05.03 FINISHES (CSI 09900)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Stains (CSI 09900) (Continued)

Oil Stains:

Oil stains consist of color pigments dispersed in drying oil (e.g., linseed oil) that has been thinned to a low consistency for maximum penetration into wood surface. These stains are generously applied to sanded wood surfaces, allowed to penetrate and dry, then excess material is wiped off. Only the stain in the wood pores remains, which is left as is, or may be rubbed with a light oil finish or receive a clear finish.

OTHER RELATED COMPONENTS

Refer to applicable sections for all assemblies and components used as substrate for paints/coatings for additional deficiencies that may impact this system.

See tables relating to paint and special coatings in subsection 1.7 of this volume.

DEFICIENCY FACTORS
0.06.05.03 FINISHES (CSI 09900)

PROBABLE FAILURE POINTS

- A change of appearance/color followed by degradation.
- Surface bubbling of dried film. May be microscopic.
- Substrate deterioration of substrate caused by moisture penetration, corrosion, rotting, and decay.
- Visible cracks through the surface of the film

SYSTEM ASSEMBLIES/DEFICIENCIES

Bubbling:	Rapid solvent volatilization within the film. Air 'displacement resulting from absorption of wet film into porous substrate.
Cracking:	Stress or compression cracking or rigid substrate. Bending or flexing on non-rigid substrates. Physical damage: impact, heat, cold, exposure, etc.
Soiling:	Exterior dirt and soil.
Chalking:	Paint weathering at the coating surface.
Checking & Cracking:	Temperature change causing the overlaying paint to expand and contract, causing it to become hard and brittle.
Erosion:	As chalking continues, the entire coating wears away or erodes and becomes thinner. Eventually, it becomes too thin to hide the substrate.

DEFICIENCY FACTORS
0.06.05.03 FINISHES **(CSI 09900)**

END OF SUBSECTION

0.06.06.01 COVERINGS (CSI 09950)

DESCRIPTION

Wall coverings are produced in 54-inch wide sheets and roll lengths of 30 to 60 linear yards, or 27 inch wide rolls of 36 square feet. There are generally three types of wall coverings: vinyl, textile, and heavy duty synthetic textile wall coverings. These wall coverings are durable, resistant to water and grease and come in a variety of colors, prints, and panels. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Wall Covering **(CSI 09950)**

ASTM F 793 classifies wall coverings by durability. It has established six categories:

- Category I, Decorative Only: Chiefly for decorative purposes. Wallpaper and other primarily residential wall coverings fall in this category.
- Category II, Decorative with Limited Serviceability: Primary decorative, but more washable and colorfast than Category I wall coverings.
- Category III, Decorative with Medium Serviceability: Used where medium abrasion resistance, stain resistance, scrubability, and increased colorfastness are necessary. Category III wall coverings have minimum breaking strength and cracking resistance criteria(resistance to transfer of color from wall covering surface when rubbed).
- Category IV, Decorative with High Serviceability: Use where high abrasion resistance, stain resistance, and scrubability are necessary in heavy consumer and light commercial use. These wall coverings have minimum cracking resistance, heat aging resistance, and breaking strength criteria.
- Category V, Medium Commercial Serviceability: Use where better wearing qualities are required and exposure to wear is greater than normal. They have minimum high abrasion resistance, stain resistance, and colorfastness criteria, and have higher cracking resistance, tear resistance, and strength criteria than Categories I through IV.
- Category VI, Full Commercial Serviceability: Wall coverings in this section are manufactured for use in heavy traffic areas. Category VI wall coverings have the highest resistance to abrasion, staining, tearing, colorfastness, cracking, and blocking. Breaking strength, coating adhesion, cold cracking, and heat aging tests also apply.

Mildew Resistance: Organic materials such as cotton, wool, paper, leather, and many adhesive are susceptible to mildew. To reduce staining, wall coverings and adhesives usually contain fungicides to resist mildew growth. These inhibitors may be toxic (including mercury or arsenic).

Adhesives: The newer pastes for vinyl wall coverings are light-weight clear-drying adhesives. These products leave dull transparent films when dry, eiiminating,the appearance of paste residue inherent with the traditional opaque clay-based adhesives.

Strippable adhesives save installation time and lessen many of the problems caused by improperly prepared substrates. A true strippable adhesive allows a fabric-backed wall covering to be installed over unprimed gypsum board and its removal without damage to the gypsum board.

Vinyl-over-vinyl adhesives are for installations directly over existing wall coverings without adhesion-promoting primers. Vinyl-over-vinyl adhesion is also used to install borders on vinyl wall covering.

ASTM Standard in Building Codes. **Twenty-Seventh** Edition, **1990.**

0.06.06.01 COVERINGS (CSI 09950)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Wall Covering (CSI 09950) (Contmued)

Substrate preparation is critical to wall covering application. Wall coverings require substrates that are clean, smooth, dry, and free of flaking or unsound coating. Fill and sand any spots or cracks smooth to prevent showing through the wall covering.

Vinyl Wall Covering (CSI 09950)

Vinyl wall covering is inherently washable. It is more durable than paint, lasting up to four times longer. Plasticizing agents used in coating vinyl wall coverings absorb some stains through a wicking process. An impervious coating can be applied to prevent this.

Wallpaper (CSI 07750)

Wallpaper is the most common for residential applications. Wallpaper designs are printed by a variety of methods, including rotogravure, flexography, surface, and screen. Imported wallpapers with silk-screened designs and hand-blocked prints are also available. Protective polymer coatings enhance performance characteristics. Coatings are either hot-embossed or cold-embossed. Thermoplastic materials such as vinyl are used with strippable products.

Textile Wall Coverings (CSI 09950)

Textile wall covering is usually laminated to a backing to enhance dimensional stability and to prevent the adhesive from coming through to the surface. These backings are acrylic or paper. Depending on textile characteristics, the wall should be pretrimmed before installing wall covering.

Heavy-duty synthetic textile wall coverings are for heavy wear areas combining the look and texture of a textile with the stain and abrasion resistance of a vinyl. High performance synthetic yarns are tight woven into textile and applied to paper or acrylic backing.

The abrasion resistance ratings for heavy-duty synthetic textile wall coverings exceed those for heavy-duty vinyl wall covering. Tear and breaking strengths are unmatched by vinyl. These coverings stand up under cleaning with harsh chemicals.

Acoustical Wall Panels (CSI 09521)

Wall panels, although commonly limited to 1 or 2-foot modular widths and heights of 8, 9, or 10 feet, can be reduced in size in the field to fit existing conditions. The facing material includes both synthetic fabrics, woven or nonwoven, and perforated vinyls. Nylon and natural materials, such as wood and linen, tend to sag in humid conditions. Acoustical wall panels are sometimes tackable and impact resistant underlayments that generally have the disadvantage of poorer sound-absorption characteristics when compared to cores without underlayment.

<u>Fire Performance Characteristics</u>:

The surface burning behavior of wall coverings is measured by testing material and adhesive over an inorganic reinforced cement board. Some wall coverings have inherently low surface burning characteristics. Others require treatment to reduce flame spread and smoke density ratings to a level that satisfies code requirements. Textile and paper wall coverings can be treated to reduce flammability.

Model building code and local ordinance and regulation dictate fire classification for finishes required within various structures or use groups.

0.06.06.01 COVERINGS (CSI 09950)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Acoustical Wall Panels (CSI 09521) (Continued)

Flame Spread Classifications:

The classification of interior finishes referred to herein correspond to flame spread ratings determined by ASTM E84 as follows:

- Class I Flame Spread, O-25
- Class II Flame Spread, 26-75
- Class III Flame Spread, 76-200

OTHER RELATED COMPONENTS

See the following subsections for related components:

0.09.06.01 COVERINGS (CSI 09950)

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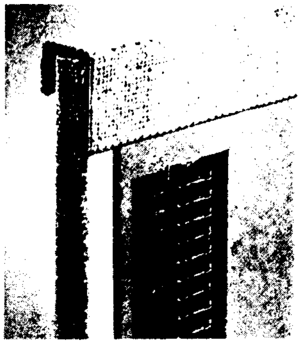
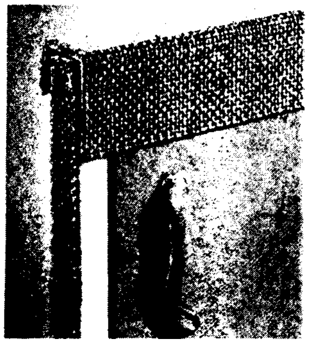
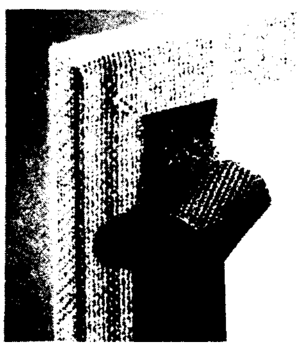


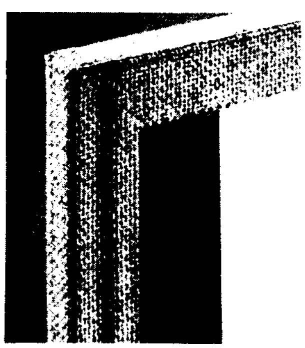
MECHANICAL CLIP



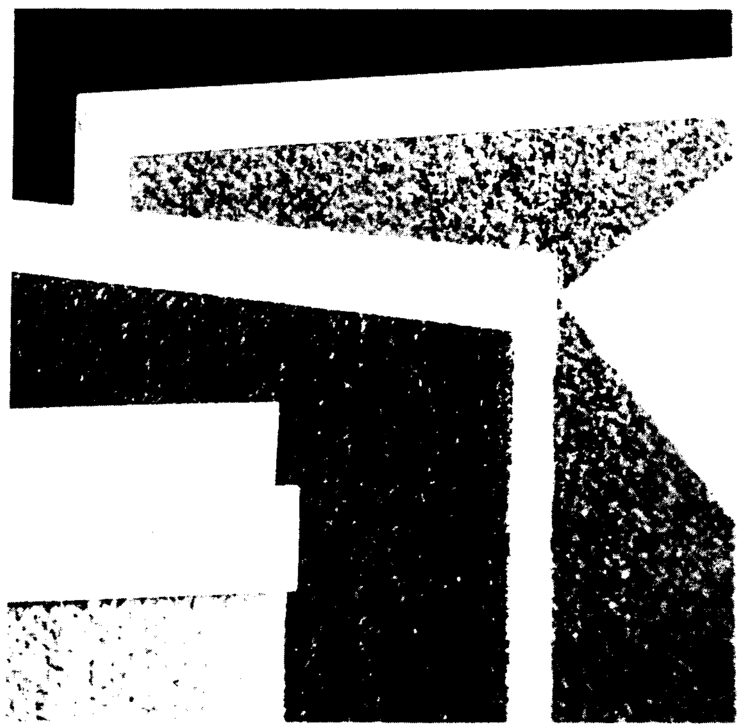
ADHESIVE MOUNTING



VELCRO FASTENER



MAGNETIC FASTENER



ACOUSTICAL WALL PANELS

SOURCE Armstrong Commercial Wall Products

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	ACOUSTICAL WALL COVERINGS & ACCESSORIES		
WALL COVERING SYSTEMS COVERINGS (CSI 09520)	Revision No.	Issue Date 5/93	Drawing No. A060601-1

DEFICIENCY FACTORS
0.06.06.01 COVERINGS **(CSI 09950)**

PROBABLE FAILURE POINTS

- Direct sunlight causing premature aging and deterioration.
- Cracking, color transfer from wall covering surface when rubbed.
- Lack of adhesiveness.

SYSTEM ASSEMBLIES/DEFICIENCIES

Abrasion:	Contact with moving parts.
Staining:	Surface discoloration from other materials.
Tearing:	Cracking, object rubbing against it.
Heat Aging:	Direct sunlight over a period of time.
Cracking:	Transfer of color from wall covering surface when rubbed.
Bubbles:	Inadequate installation method.
Delamination of Covering:	Inadequate adhesion.

DEFICIENCY FACTORS
0.09.06.01 COVERINGS (CSI 09950)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	DELAMINATION OF WALLCOVERING		
WALL COVERING SYSTEMS COVERINGS (CSI 09950)	Revision No.	Issue Date 5/93	Drawing No. D060601-1

DEFICIENCY FACTORS
0.06.06.01 COVERINGS (CSI 06950)

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DEFICIENCY FACTORS
0.06.06.01 COVERINGS **(CSI 09950)**

END OF SUBSECTION

0.06.06.02 PANELING (CSI 06403)

DESCRIPTION

Millwork paneling includes flush or raised panel constructions used to cover vertical surfaces. Large, flat areas like paneling are built of thin wood veneers glued to backing panels of particleboard or plywood. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Paneling (CSI 06402)

Paneling is adapted to a wide variety of finishing treatments including natural, stained, blonde, enameled, or painted finishes. The most distinctive effects are obtainable only with finishes that permit the natural beauty of wood to be revealed.

Make-Up of Veneer Paneling:

There are several methods to match adjacent pieces of veneer and veneer panels in a room that affect the final appearance of the job. The three considerations in increasing order of scale are matching between adjacent veneer leaves, matching veneers within a panel, and matching panels within a room.

There are three ways that panels are matched; bookmatching is the most common. As the veneers are sliced off the log, every other piece is turned over so that adjacent leaves form a symmetrical grain pattern. With slip matching, consecutive pieces are placed side-by-side with the same face sides being exposed. Random matching places veneers in no particular sequence, and even veneers from different flitches may be used.

Veneers are glued to rigid panels for installation; the method is called running match, which is simply alternated bookmatched veneer pieces, regardless of their width or how many. They must be used to complete a panel. Any portion left over from the last leaf of one panel is used as the starting piece for the next. A balance match uses veneer pieces trimmed to equal widths in each panel. A center match has an even number of veneer leaves of uniform width so that there is a veneer joint in the center of the panel.

Premanufactured panels, normally 4 feet wide by 8 or 10 feet long, are assembled from a single flitch that yields from 6 to 12 panels.

Laminates:

A common finishing material used with millwork is high-pressure plastic laminate. This is a thin sheet material made by impregnating several layers of craft paper with phenolic resins and overlaying the paper with a patterned or color sheet and a layer of melamine resin. Plastic laminates are used for countertops, wall paneling, etc.

Because laminates are very thin, they must be adhered to panel substrates such as plywood or particle board. Smaller pieces can be glued to solid pieces of lumber. There are several types and thicknesses of plastic laminate, the most common is a general-purpose type that is 0.050-inches thick. It is used for both vertical and horizontal applications. When plastic laminate is applied to large surfaces of paneling, it must be balanced with a backing sheet to inhibit moisture absorption and to attain structural balance so the panel does not warp.

Fiberglass Panels (CSI 09986)

Fiberglass paneling is a system that can withstand impact and abrasion. Made of fiberglass reinforced plastic, it is used in areas of processing and other buildings where minimal maintenance and strict sanitation control is required.

0.06.06.02 PANELING (CSI 00403)

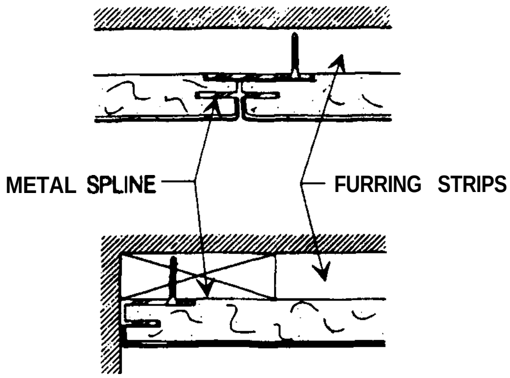
ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Fiberglass Panels (CSI 09986) (Continued)

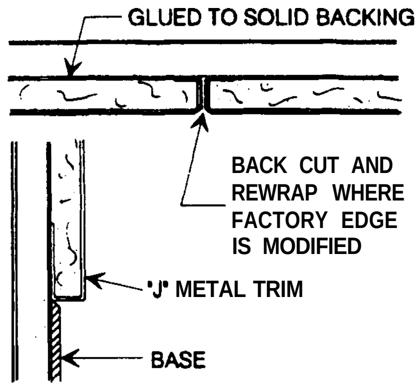
The impervious surface allows dirt and grease to be easily cleaned and is extremely resistant to most stains and chemicals. It is moisture resistant and impervious to mold or mildew, and does not rust or corrode. Fiberglass panel comes in sizes of 4 x 8 feet and 4 x 10 feet, and thicknesses of 1/4, 5/16, 1/2, 5/8 and 3/4 inches.

OTHER RELATED COMPONENTS

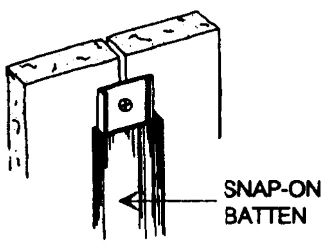
See the following subsections for related components:



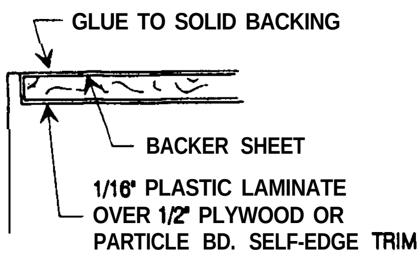
FABRIC COVERED FIBERBOARD



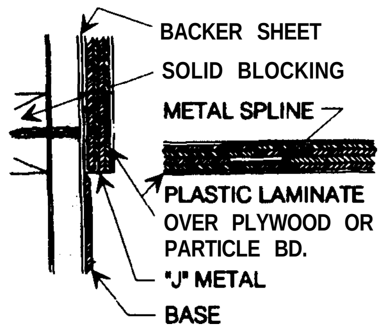
VINYL COVERED FIBERBOARD



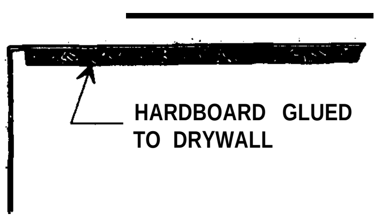
VINYL COVERED GYPSUM BOARD



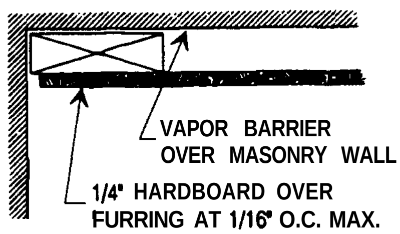
PLASTIC LAMINATE PANELS



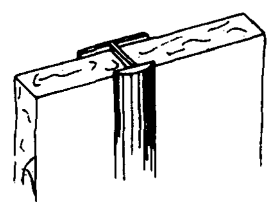
PLASTIC LAMINATE PANELS



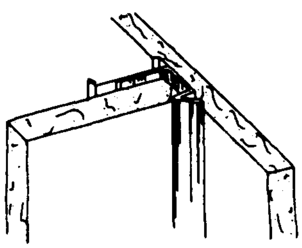
TEMPERED HARDBOARD



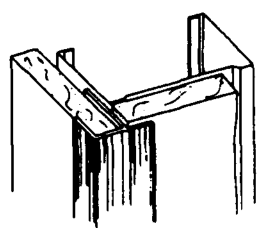
TEMPERED HARDBOARD



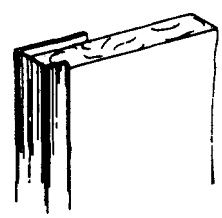
DIVIDER



INSIDE CORNER TRIM

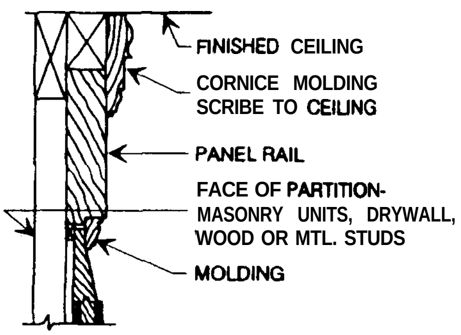


OUTSIDE CORNER TRIM

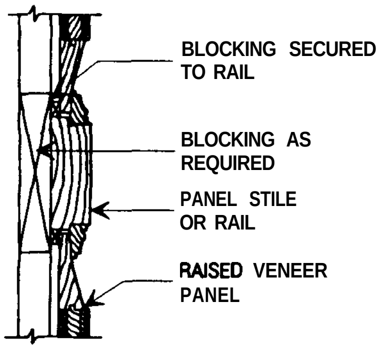


END CAP

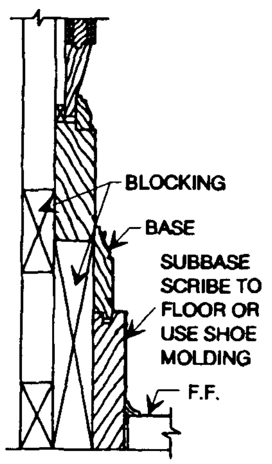
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	PANELING & ACCESSORIES		
WALL COVERING SYSTEMS PANELING (CSI 09540)	Revision No.	Issue Date 5/93	Drawing No. A060602-1



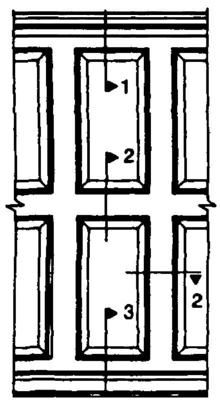
1 CEILING CLOSURE



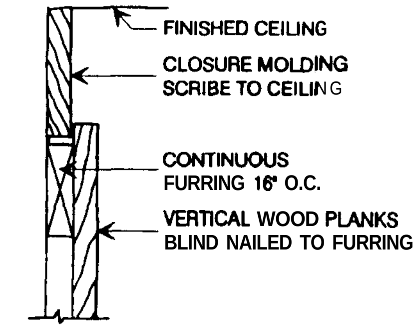
2 RAIL OR STILE



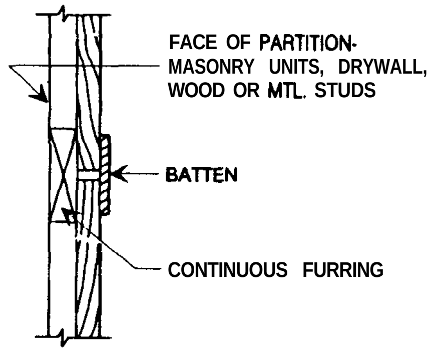
3 BASE



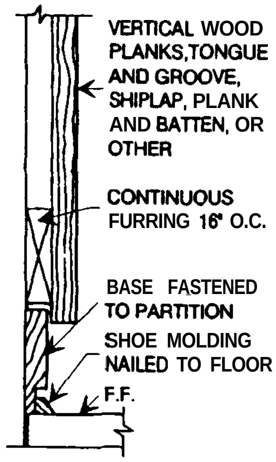
ELEVATION



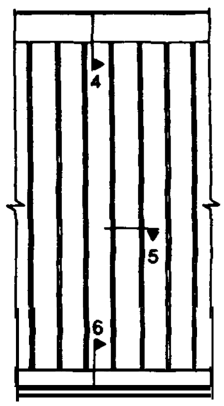
4 RECESSED CEILING CLOSURE



5 BATTEN



6 RECESSED BASE



ELEVATION

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	PANELING & ACCESSORIES		
WALL COVERING SYSTEMS PANELING (CSI 09540)	Revision No.	Issue Date 5/93	Drawing No. A060602-2

DEFICIENCY FACTORS
0.06.06.02 PANELING (CSI 06403)

PROBABLE FAILURE POINTS

- Decay (rot) due to fungi, mildew, dryrot causing surface deterioration.
- Fire damaged or charred surfaces causing surface flaking or breakdown.
- Loose connection caused by vibration
- Spitting or checking caused by stress, bending, or twisting.
- Impact damage caused by objects striking or impacting with the surface.

SYSTEM ASSEMBLIES/DEFICIENCIES

Dryrot/Decay:	Breakdown of structural integrity from mold/mildew or dryrot.
Splitting:	Surface splitting or tearing
Burned or Charred Surface:	Damage from fire or excessive heat of surface.
Missing Sections:	Rotting, missing, or deteriorated supports.
Surface Deterioration:	Small surface cracks and breakdown from pressure or other actions.
Staining:	Surface discoloration from a foreign substance or material.
Cracking:	Cracking, which results in tearing, ripping, or shearing of the panels. Cracks can be random, horizontal, vertical, or diagonal.
Warping:	A deviation of wall surface from its original shape, usually caused by temperature and/or moisture differentials within the wall.
Impact Damage:	Depressions, dents, or buckled surface from objects sticking or impacting the surface.
Delamination of Finish:	Separation of plies due to adhesive failure, such as in veneer and laminated paneling.

DEFICIENCY FACTORS
0.06.06.02 PANELING (CSI 064031

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	DELAMINATION OF WOOD PANELING		
WALL COVERING SYSTEMS PANELING (CSI 06250)	Revision No.	Issue Date 5/93	Drawing No. D060602-1

DEFICIENCY FACTORS
0.06.06.02 PANELING (CSI 06403)

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DEFICIENCY FACTORS
0.06.06.02 PANELING (CSI 06403)

END OF SUBSECTION

0.06.06.03 WALL TILE (CSI 09300)

DESCRIPTION

Ceramic tile is defined as a surfacing unit, relatively thin in relation to facial area, made from clay or a mixture of clay and other ceramic materials, having either a glazed or unglazed face, and fired to produce specific physical properties and characteristics. Typical locations are toilet rooms, kitchens, clean rooms, and sanitary type areas. Quarry tile is glazed or unglazed tile made by an extrusion process using natural clay or shale.

Tile Installation:

Tile must be installed on firm, solid, flat substrates capable of supporting the weight of the material. The traditional method of installing tile is to lay it in a thick bed of mortar, both on floors and walls. This is still the preferred method for quality installations and wet locations such as shower rooms, pools, and steam rooms. Tile may also be installed with the thin-set method using a thin layer of latex- Portland cement mortar or other adhesive. Thin-set is descriptive of bonding materials for tile applied in a layer approximately 1/8 inch or 3mm thick.

Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Ceramic Tile (CSI 09300)

Tile is a term defined in ANSI A137.1 as “a ceramic surfacing unit, usually relatively thin in relation to facial area, made from clay or a mixture of clay and other ceramic materials, called the body of tile, having either a glazed or unglazed face and fired above red heat is the course manufacture to a temperature sufficiently high to produce specific physical properties and characteristics.”

Classification of Tiles:

The United States Tile Industry classifies tile based on size: 6 square inches is mosaic tile, and over 6 square inches is wall tile. Glazed and unglazed non-mosaic tile made by the extrusion method is quarry tile: glazed and unglazed tile over 6 square inches made by the dust-pressed method is called paver tile.

Tile is often classed according to resistance to water absorption as follows:

- Non-vitreous tile: water absorption of more than 7.0 percent.
- Semi-vitreous tile: water absorption of more than 3.0 but not more than 7.0 percent.
- Vitreous tile: water absorption of more than 0.5 percent but not more than 3.0 percent
- Impervious tile: water absorption of 0.5 percent or less.

Imported tile is classified differently than tile produced in the United States. European manufacturers classify tile according to its production method, either the dust-press or extrusion method, its degree of water absorption, its finish, and whether it is glazed or unglazed.

The classification of abrasion resistance are: Group I, light residential: Group II, moderate residential; Group III: maximum residential; Group IV, highest abrasion resistance-commercial,

0.06.06.03 WALL TILE (CSI 09300)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Tile Sizes

Standard	Glazed Wall	Quarry
		3" x 3"
1"x 1"	$4^1/_4$" x $4^1/_4$"	4" x 4"
2" x 2"	6" x 6"	6" x6"
1"x 2"	4' $1^1/_4$" x 6"	8" x 8"
4" x 4"	Thickness 5/16"	3" x 6"
4" x 2"		4" x 8"
Thickness $^1/_4$"		Thicknesses $^1/_2$" to $^3/_4$"

Glazed Wall Tiles (CSI 09300)

Glazed wall tiles are units with an impervious glazed finish usually fused to a non-vitreous body of sort whiteware with water absorption not exceeding 18 percent. This tile is not intended to withstand excessive impact or exposure to freezing and thawing. Because it has limited capability to endure abrasion and to resist food acids, it should only be used in vertical application and non-traffic applications such as counter tops that are not subject to heavy-duty use.

Unglazed Ceramic Mosaic **Tiles** (CSI 09300)

Unglazed ceramic mosaic tiles are small units with a facial area less than 6 square inches that are formed by either the dust-pressed or the plastic method. They may be porcelain or natural clay and are available with abrasive content for slip resistance. Porcelain tiles are classified as impervious with water absorption of less than 0.5 percent. Natural clay tiles are classified as either impervious or vitreous, with the water absorption of the latter not exceeding 3 percent. Porcelain units have a hardness rating of 100 and natural clay 50. Abrasion treatment will not affect appearance as it would in a glazed product. Greater strength and lower water absorption make this a durable tile that is intended for use on both exterior and interior horizontal and vertical surfaces, including floors.

Glazed Ceramic Mosaic Tile (CSI 09300)

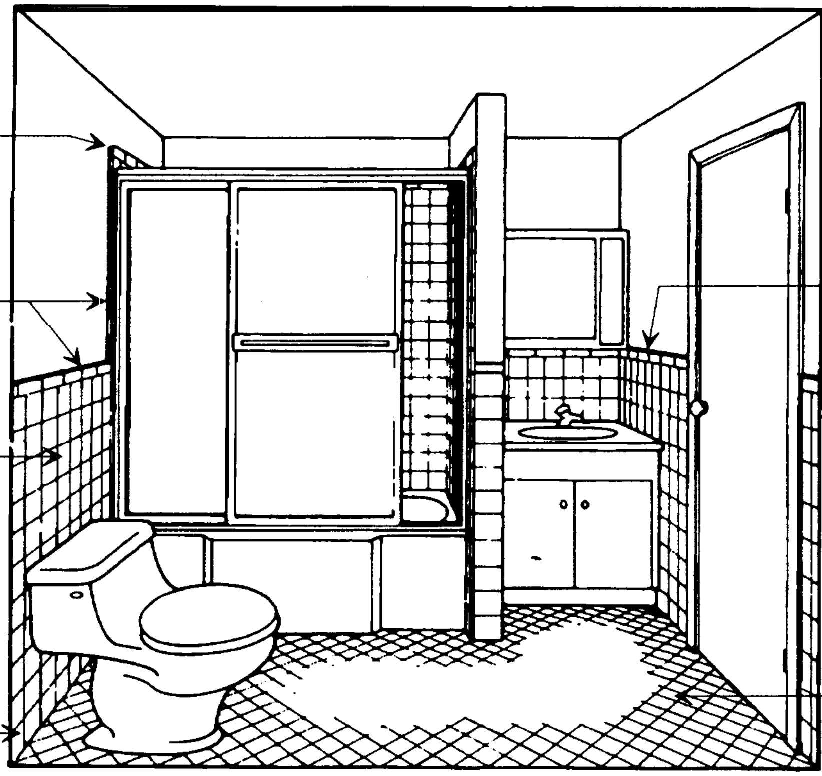
Glazed ceramic mosaic tiles are the same composition as unglazed units except that a glazed finish is fused to the body of the tile, which unlike unglazed units, is untinted. Glazed units tend to have lower values than unglazed units when tested for coefficient of friction and may not be suitable for horizontal traffic surfaces.

Quarry Tiles (CSI 09300)

Quarry tiles are unglazed or glazed units with a facial area usually exceeding 6 square inches and a thickness of 1/2 or 3/4 inches. They are extruded from natural clay or shale. Their water absorption is 5 percent or less. Quarry tile is virtually unaffected by moisture, acid, oils, or chemicals and is intended for interior and exterior applications where tile with optimum performance characteristics is needed.

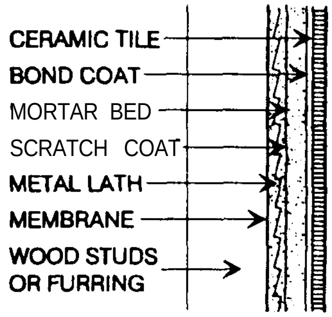
OTHER RELATED COMPONENTS

See the following subsections for related components:

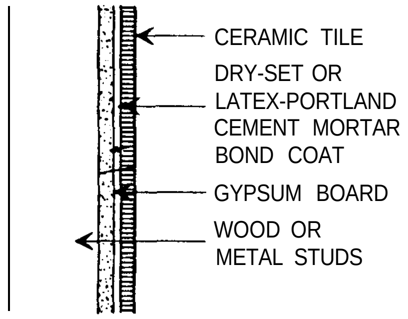


SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

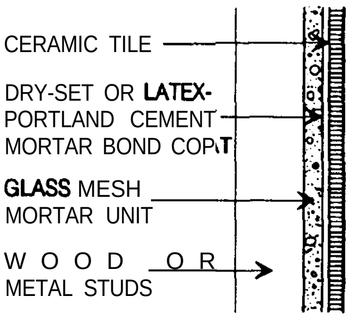
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	CERAMIC TILE, TYPICAL USAGE		
WALL COVERING SYSTEMS TILE (CSI 09300)	Revision No.	Issue Date 5/93	Drawing No. A060603-1



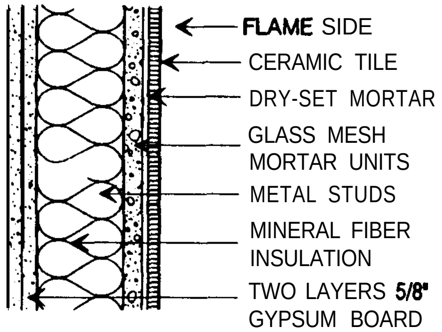
CEMENT MORTAR



DRY-SET MORTAR

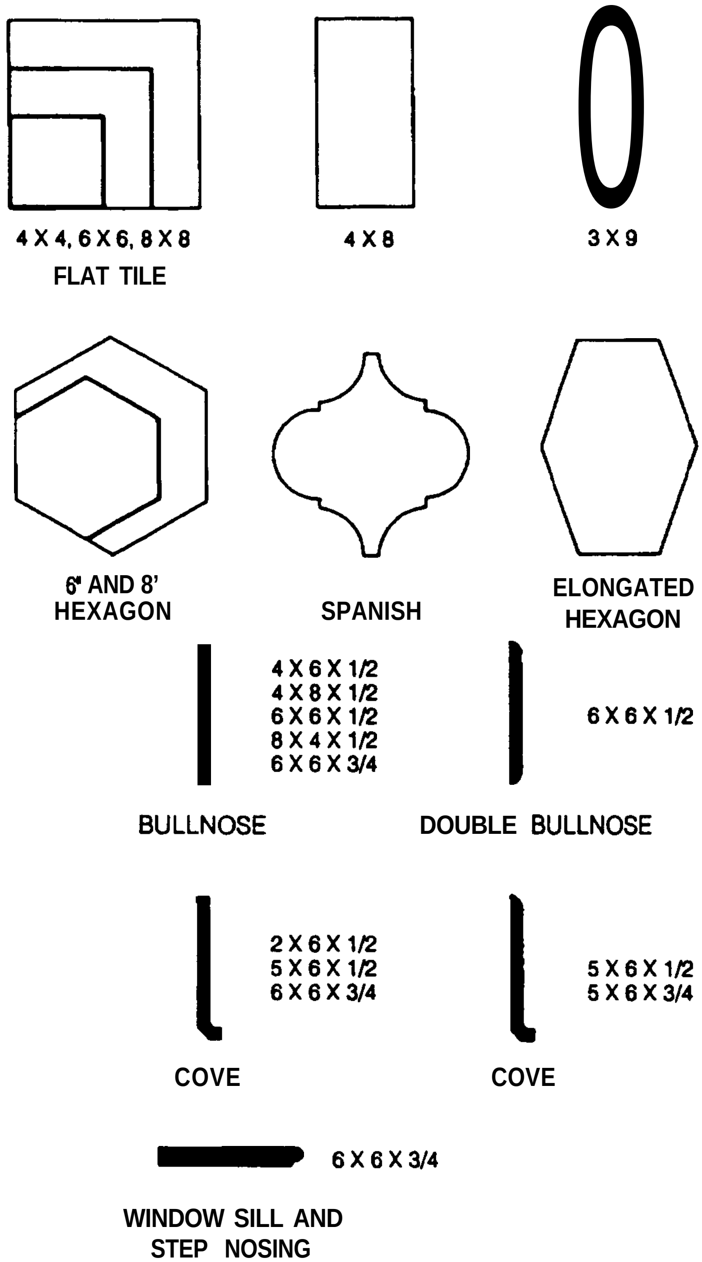


DRY-SET MORTAR WITH GLASS MESH MORTAR UNIT



DRY -SET MORTAR (FIRE-RATED WALL)

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**CERAMIC TILE** **TYPICAL MORTAR INSTALLATIONS**		
WALL COVERING SYSTEMS **TILE (CSI 09310)**	Revision No.	Issue Date 5/93	Drawing No. A060603-2



TRIM PROFILES (H X L)

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**PROFILES OF QUARRY/PAVER TILES**		
WALL COVERING SYSTEMS **TILE (CSI 09330,09340)**	Revision No.	Issue Date 5/93	Drawing No. A060603-3

DEFICIENCY FACTORS
0.06.06.03 WALL TILE (CSI 09300)

PROBABLE FAILURE POINTS

- Broken, loose tile caused by abuse, brittleness.
- Missing tile.
- Deteriorating grout caused by excessive moisture.
- Water damage caused by water leakage.
- Impact damage caused by tile being unsuitable for exposure conditions and/or location.

SYSTEM ASSEMBLIES/DEFICIENCIES

Broken/Loose Tile:	Broken/missing tile by impact damage.
Missing Tile:	Impact, lack of grout, or deteriorated grout.
Grout Deterioration:	Damaged or deteriorated joints that have fallen out or worn down.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Water Damage:	Water leakage.
Staining:	Surface discoloration from foreign substances or materials.

DEFICIENCY FACTORS
0.06.06.03 WALL TILE (CSI 09300)

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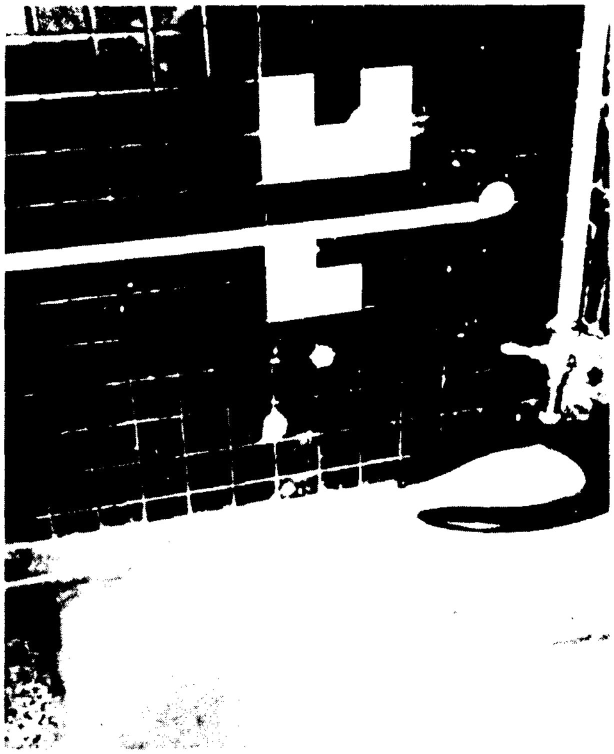

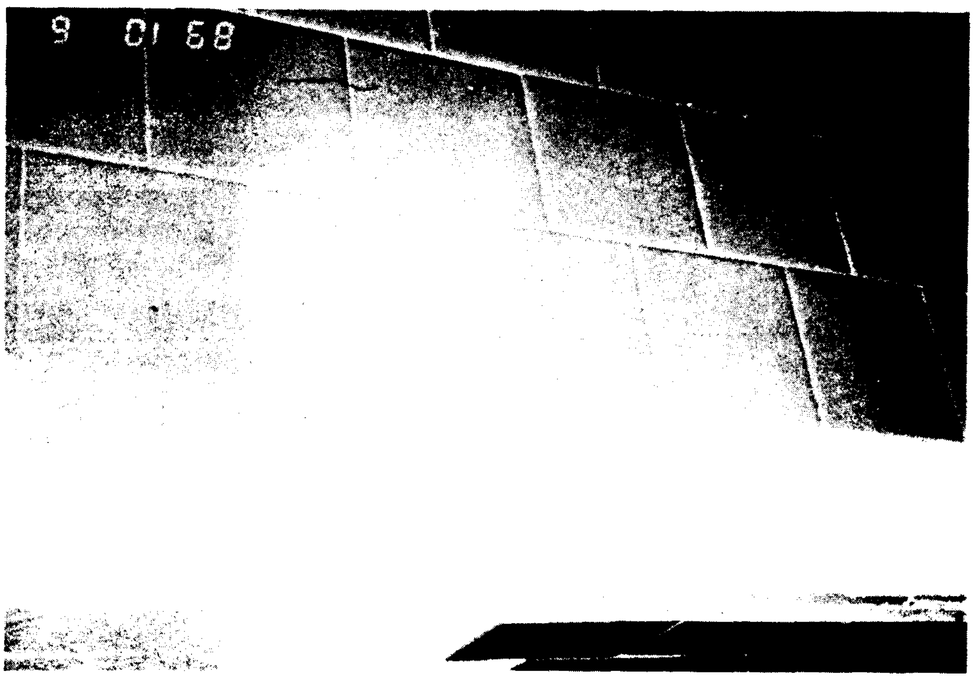

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	MISSING CERAMIC TILE		
WALL COVERING SYSTEMS TILE (CSI 09310)	Revision No.	Issue Date 5/93	Drawing No. D060603-1

DEFICIENCY FACTORS
0.06.06.03 WALL TILE **(CSI 09300)**

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DEFICIENCY FACTORS
0.06.06.03 WALL TILE (CSI 093001

END OF SUBSECTION

0.06.07.01 CARPET (CSI 09660)

DESCRIPTION

Carpeting is a versatile flooring providing an attractive, easy to install, and low maintenance material that will last for years if properly installed. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Carpet (CSI 06660)

Carpet is made from fibers, including wool, nylon, acrylic, polyester, and polypropylene. Carpet is manufactured by tufting, weaving, needle punching, and fusion bonding.

Tufting is the most common way of producing carpet. Pile yarns are inserted through a prewoven backing and tops of the yarns are then cut for cut pile carpet or left as is for level loop carpet. Construction is similar to sewing, except a tufting machine sews many rows at a time. The back side is coated with latex to secure the tufts, and a secondary backing material is adhered for dimensional stability.

Weaving is the oldest carpet construction method. It requires more elaborate manufacturing, but is longer wearing and more dimensionally stable. Weaving interlaces warp and weft yarns in the traditional manner, a method that produces a very attractive, durable product.

Needle punching pulls fibers through a backing with barbed needles. It produces carpet of limited variation in texture and accounts for a very small percentage of the total carpet market.

Fusion bonding embeds fabric in a synthetic backing. It is used to produce carpet tiles as well as traditional carpet. Fusion bonded goods dominate the market in the United States. Its face is the most dense and the backing is not penetrated by a needle, as in tufting or needle punching. A yarn bundle is sandwiched between and implanted into substrates and heat-fused; a blade is then run between the substrates, producing two carpet pieces.

Face Fiber:

The face fiber most commonly used in commercial carpet is nylon. Wool blends are less common in commercial installations, but popular for entertainment areas such hotel lobbies.

- Nylon is an economical carpet material that is very strong and wear resistant. It has a high stain resistance and is easy to clean. However, its appearance is generally less appealing than that of other fibers. It is the most popular fiber for commercial carpet, constituting 85 percent of that market. Nylon is resilient and resistant to crushing. In the past it has been inherently high in static electricity buildup; but today's manufacturers have developed antistatic nylon carpet.
- Acrylic has moderate durability, but it has a more wool-like appearance than nylon. It is easy to maintain and has a fair crush resistance. Polyester has properties similar to acrylic.
- Polypropylene is used for indoor-outdoor carpeting and has good durability and resistance to abrasion and fading, but it is less attractive and has poor resiliency.

0.06.07.01 CARPET **(CSI 09680)**

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Carpet (CSI 09680) (Continued)

Carpet Cushion Types:

Carpet cushion types are fiber, sponge rubber, prime urethane foam, and bonded foam.

- Fiber cushions are composed of natural fibers (such as hair and jute) or synthetic fibers (such as nylon, polyester, and polypropylene). Hair and jute blends are normally mothproofed and sterilized. They are primarily intended for above-grade installation because they tend to absorb moisture. Mildew resistance is imperative if available. The grade of fiber cushion is determtned by its weight in ounces per square yard.
- Sponge rubber cushion types are flat and waffled. Flat sponge offers a firm feel; waffled sponge is softer.
- Prime urethane foam cushion types are prime and densified prime. Both are a high-density homogeneous polymeric foam. The densified prime urethane is modified chemically for a better wear performance. Foam is unaffected by moisture and will not oxidize, crumble, or deteriorate.
- Bonded urethane foam, sometimes called rebond, is manufactured from scraps adhered and heat-fused together; it is not homogeneous.

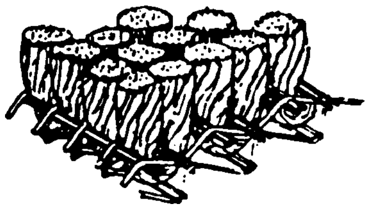
Installation:

- There are three basic carpet installation methods: stretch-in, direct glue-down, and double glue-down. Double glue-down is the only method that requires a cushion.
- Stretch-in installations use tackless strips at the perimeter to grip the carpet and hold it in place. These strips have pins that are long enough to penetrate the backing but not so long as to present a safety hazard.
- Direct glue-down installation glues the carpet, with or without an attached cushion back, directly to the substrate.
- Double glue-down installation adheres a separate cushion to the substrate, and the adhesive adheres the carpet to the cushion.

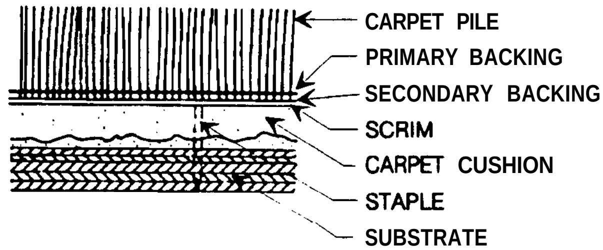
Flame spread is associated with carpet material in a fully developed fire, where high temperatures are being developed and radiated down onto the floor in conjunction with an advancing flame front. For flame spread under these, the Flooring Radiant Panel Test (ASTM E 648) or NFPA 253 is used. It is different from most other fire test methods in that it measures a carpet's property and is not based on an arbitrary scale.

OTHER RELATED COMPONENTS

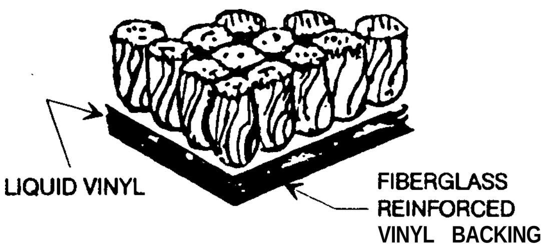
Refer to Substructure and Superstructure, Volumes 2 and 3 for additional deficiencies that may impact this system.



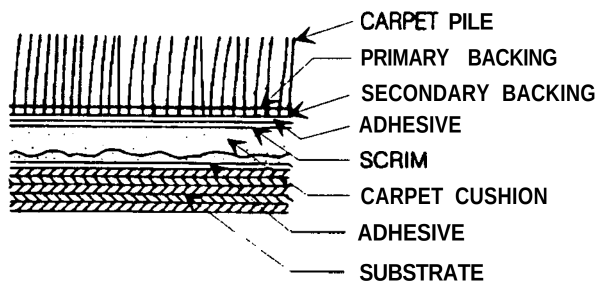
WOVEN



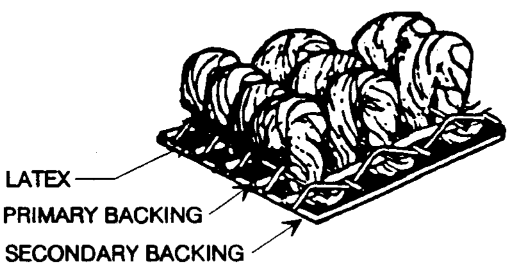
STRETCH-IN TACKLESS



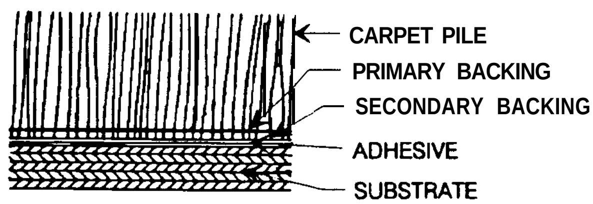
FUSION BONDED



DIRECT GLUE DOWN



TUFTED



DIRECT GLUE DOWN

CARPET CONSTRUCTION

CARPET INSTALLATION

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	**CARPETING TYPES & INSTALLATION**		
FLOOR FINISHING SYSTEMS **CARPET (CSI 09680)**	Revision No.	Issue Date 5/93	Drawing No. A060701-1

DEFICIENCY FACTORS
0.06.07.01 CARPET (CSI 09680)

PROBABLE FAILURE POINTS

- Amount and type of pedestrian traffic.
- Vehicular traffic (e.g., carts, wheel chairs).
- Exposure to stains and cigarette burns that are capable of staining, softening, or otherwise damaging flooring.
- Exposure to in-surface damage such as cuts, tears, punctures, permanent surface indentation and gouges.
- Seams improperly installed resulting in premature wear.
- Improper installation resulting in ridging, uneven wear, etc.

SYSTEM ASSEMBLIES/DEFICIENCIES

Abrasion:	Contact with moving parts.
Staining:	Carpet discoloration caused by other foreign material
Tearing:	Objects passing across the surface of the carpet.
Heat Aging:	Direct sunlight affect the surface by ultra-violet rays.
Adhesion:	Lack of adhesion causing carpet to come apart at the seams.
Loose Seams/Worn Surface:	Pedestrian/vehicular traffic (e.g., carts, wheel chairs).
Excessive Ridging:	Unevenness in the finish substrate below the carpet.

DEFICIENCY FACTORS
0.06.07.01 CARPET (CSI 096601

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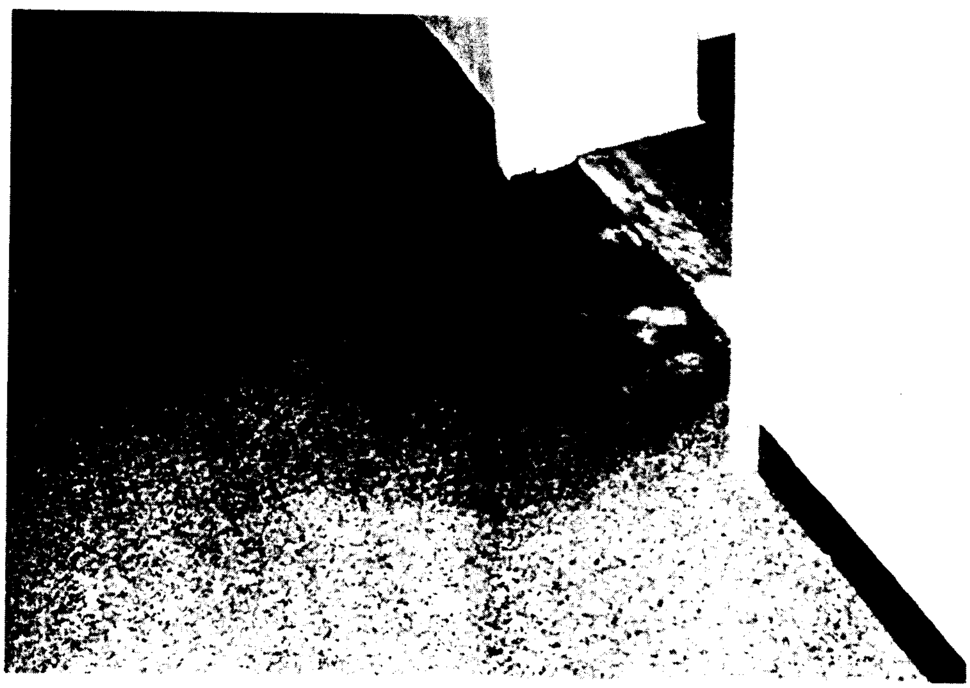

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	WATER DAMAGED CARPET		
FLOOR FINISHING SYSTEMS CARPET (CSI 09680)	Revision No.	Issue Date 5/93	Drawing No. D060701-1

DEFICIENCY FACTORS
0.08.07.01 CARPET (CSI 09680)

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DEFICIENCY FACTORS
0.06.07.01 CARPET (CSI 09660)

END OF SUBSECTION

0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

DESCRIPTION

Resilient flooring is a generic term describing several types of composition materials made from various resins, fibers, plasticizers, and fillers formed under heat and pressure to produce a thin material, either in sheets or tiles. Resilient flooring may be applied with mastic to a subfloor of concrete, plywood, or other smooth underlayment. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Composition/Resilient Flooring (CSI **09650)**

Vinyl Flooring:

Vinyl is produced in sheet form or tiles in 1/16-inch or 1/8-inch thicknesses. It is good, durable resilient flooring resistant to indentation, abrasion, grease, water, and alkalis. Vinyl comes in a variety of colors and patterns and is easy to install. It can be used below grade, on grade, or above grade. It must be installed over a clean, dry, and smooth surface.

Vinyl Composition Floor Tile (VCT):

VCT is described in referenced ASTM F 1066 as a product "...composed of binder, fillers, and pigments." The binder consists of one or more resins of poly(vinyl chloride), or vinyl chloride copolymers, or both, compounded with suitable polymerics. Resins may be incorporated as a part of the binder.

Vinyl-Asbestos Tile (VAT):

VAT is composed of vinyl resins, plasticizers, pigments, fillers, and asbestos fibers formed under pressure while hot. It was used extensively up to the late 1960s but due to health reasons it was banned from use. Sizes 12 x 12 inch and 18 x 24 inch were available. VAT were excellent against grease, alkali, and abrasion resistance. It had easy maintenance, poor resilience and was not recommended for toilets, showers, or laundries because it was not slip resistant.

Linoleum:

Linoleum is made from oxidized linseed oil, resins, fillers, and pigments over a backing of burlap or asphalt-saturated felt. It is available in tiles but is more commonly used in sheet form. Although it is resistant to abrasion, grease, and dirt, its backing is susceptible to fungus and should not be used where moisture is present, such as below grade or on concrete floors below or on grade. Linoleum must also be installed over a clean, dry, and smooth surface.

Rubber:

This flooring is made from synthetic rubber and offers excellent resistance to deformation under loads, providing a very comfortable, quiet, resilient flooring. Rubber, however, is not very resistant to oil or grease. Rubber is often used as loose-laid matting in golf courses, skating rinks, and other areas subject to abuse from indentation. Rubber floor tile is described in ASTM F 1344.

0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

Composition/Resilient Flooring (CSI **09650)**

Rubber:

Because performance requirements for flooring may change from one part of a building to another, it is often advisable to select several different types of resilient flooring. Factors in the selection process include the following:

- Amount and type of daily pedestrian traffic.
- Abrasiveness of local soil conditions.
- Vehicular traffic (e.g., carts, wheelchairs).
- Exposure to stains, reagents, and cigarette burns that are capable of marring, softening, or otherwise damaging flooring.
- Exposure to in-surface damage such as cuts tears, punctures, permanent surface indentations, and gouges.
- Anticipated type and frequency of maintenance because it affects appearance, sanitation, and slip resistance.
- Appearance expectations.

Installation:

Resilient floors over concrete require careful selection of resilient systems and the adhesive used, and because resilient floors reflect the condition of the surface on which they are laid, care in finishing the surface of the subfloor. Only flooring that is alkali-resilient should be used over light aggregate floors, because the latter have much slower drying times, particularly when they are on grade, than floors of regular concrete. Cracks and minor holes are normally filled with a crack filler.

Resilient materials over wood floors do not require board types of underlayment when applied. Wood floors are normally sanded. Nails are set and all cracks are filled. Latex underlayment should be used where wood floors are uneven or cupped.

Adhesives are the most important factor in the duration of resilient flooring. They also affect the ease of application and later removal if necessary. The selection of an adhesive is based on the type of resilient floor to be laid. The type of subfloor, the location, and the subfloor to moisture content are considered.

- Emulsion Type - clay and asphalt base: all-purpose adhesive for asphalt and VAT at all grades. May be used over latex and asphalt-type underlayments. Resists alkali and moisture.
- Brushing Cement - asphalt and rubber base: all types of subfloors; eliminates need for lining felt: used for VAT and asphalt tile; may be used over latex and asphalt-type underlayments.
- Chemical-Set Waterproof - latex and powder: used for on or below-grade concrete for rubber or vinyl tile - resists surface moisture.
- Cement - resin-base: used on or above grade for cork or vinyl-cork and above grade for linoleum or vinyl sheet or tile where surface moisture is anticipated.
- Paste (Linoleum) - water-soluble: an all-purpose adhesive for above-grade installations for lining felt, backed sheet materials, and tile other than asphalt and VAT.
- Cement - waterproof-latex type: for concrete surfaces on- or below-grade for backed sheet materials and all tile permitted in these locations except asphalt and VAT. Alkali and moisture-resistant.

0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

Composition/Resilient Flooring (CSI **09650)**

Installation:

- Primer - solvent type: sealer for concrete surfaces before application of adhesives for asphalt and vinyl-asbestos tile. Should not be used over latex or asphalt type underlayments.

OTHER RELATED COMPONENTS

Refer to Substructure and Superstructure, Volumes 2 and 3, tor additional deficiencies that may impact this system.

0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

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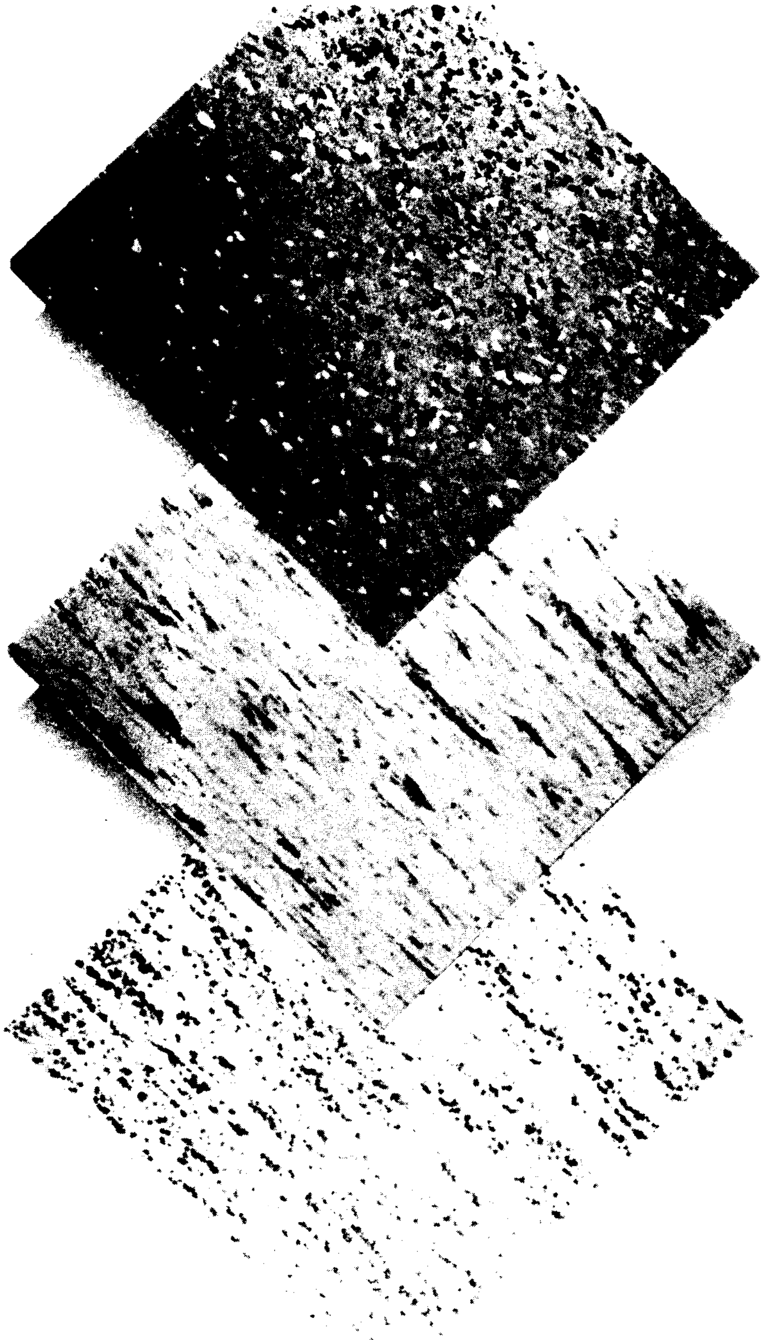
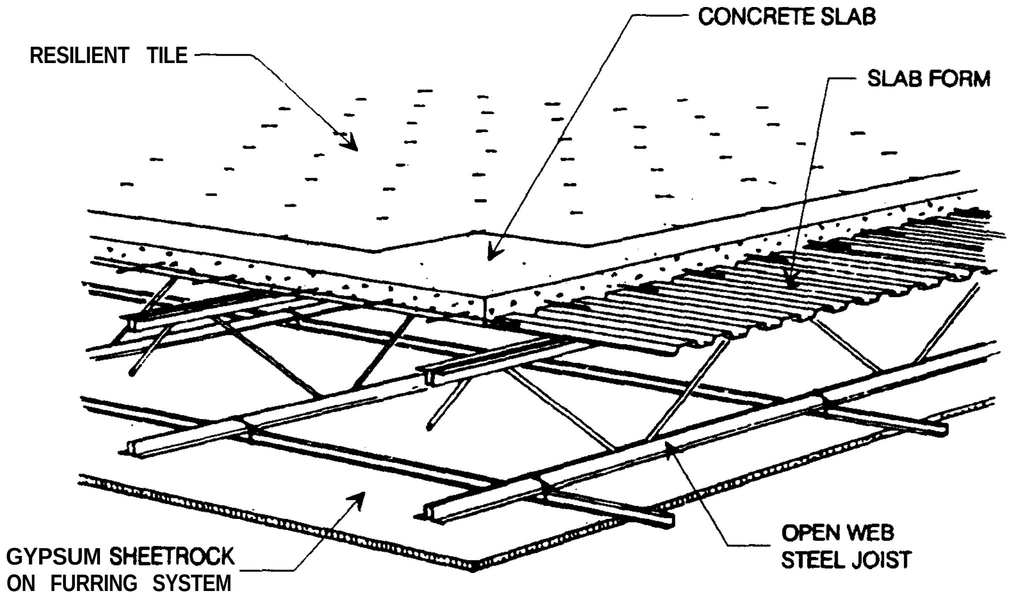
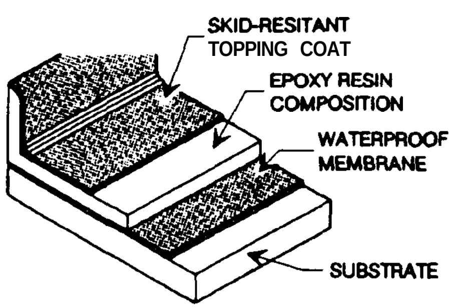


SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	COMPOSITION/RESILIENT FLOORING		
FLOOR FINISHING SYSTEMS COMPOSITION/RESILIENT FLOORING (CSI 09650)	Revision No.	Issue Date 5/93	Drawing No. A060702-1

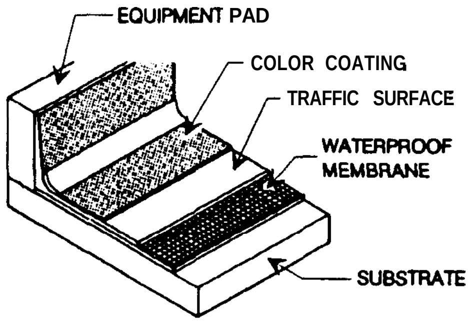


SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

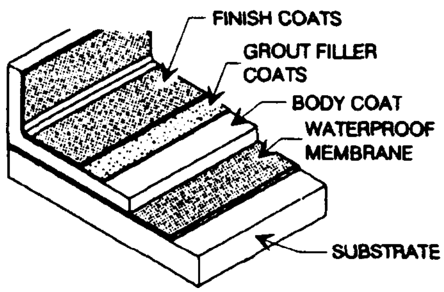
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	COMPOSITION/RESILIENT FLOORING INSTALLATION		
FLOOR FINISHING SYSTEMS COMPOSITION/RESILIENT FLOORING (CSI 09650)	Revision No.	Issue Date 5/93	Drawing No. A060702-2



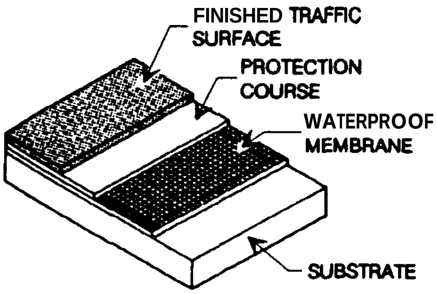
EPOXY RESIN COMPOSITION FLOORING



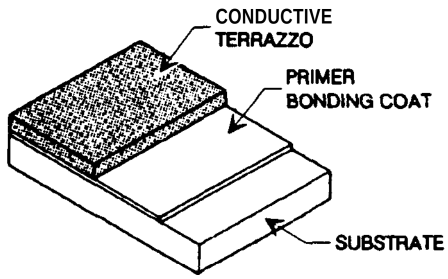
WATERPROOF LATEX MEMBRANE FLOORING



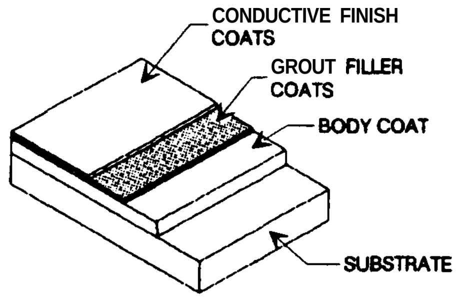
ELASTOMERIC LATEX RESIN FLOORING



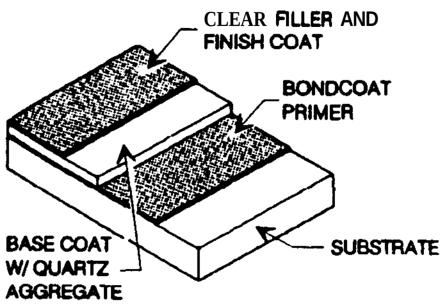
REINFORCED LATEX MEMBRANE



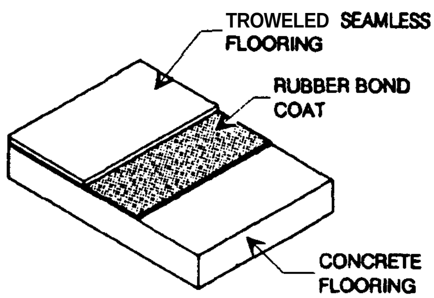
CONDUCTIVE FLOORING



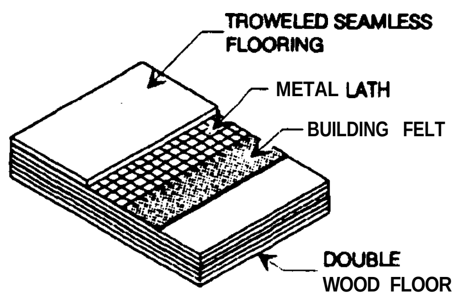
CONDUCTIVE FLOORING



EPOXY/QUARTZ AGGREGATE



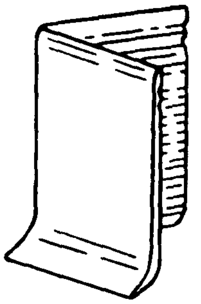
CUPIC OXYCHLORIDE FLOORING



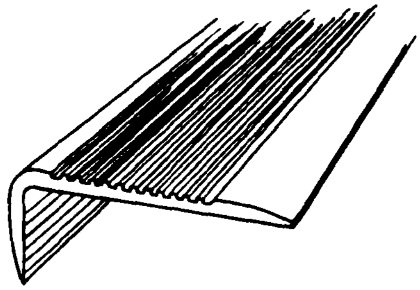
CUPIC OXYCHLORIDE FLOORING

SOURCE: ARCHITECTURAL GRAPHIC STANDARDS, EIGHTH EDITION

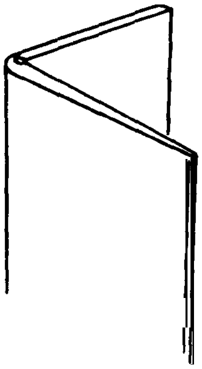
SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**TYPES OF RESILIENT FLOORING**		
FLOOR FINISHING SYSTEMS **COMPOSITION/RESILIENT FLOORING** **(CSI 09650)**	Revision No.	**Issue Date** **5/93**	**Drawing No.** **A060702-3**



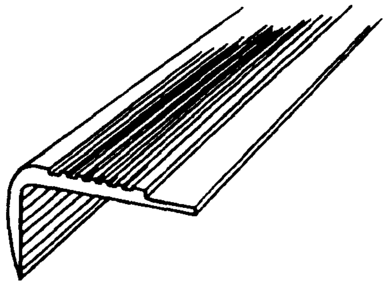
RUBBER COVE BASE-CORNER



BUTT TYPE

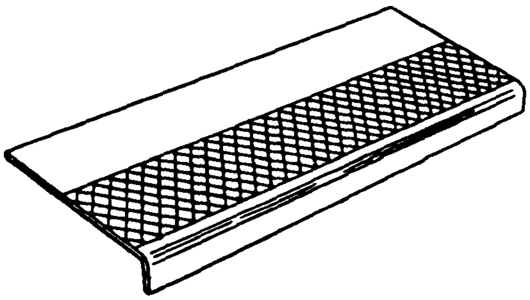


RUBBER OR VINYL CORNER GUARDS

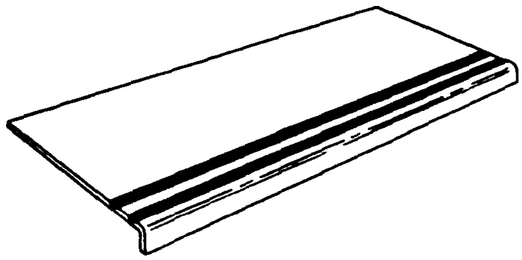


LAP TYPE

RUBBER NOSINGS, SAFETY RIB



HALF DIAMOND MOLDED RUBBER STAIR TREAD



GRIT-STRIP MOLDED RUBBER SAFETY STAIR TREAD

RUBBER STAIR TREADS

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**RESILIENT FLOORING TRIM PIECES**		
FLOOR FINISHING SYSTEMS **COMPOSITION/RESILIENT FLOORING** **(CSI 09650)**	**Revision No.**	**Issue Date** **5/93**	**Drawing No.** **A060702-4**

DEFICIENCY FACTORS
0.06.07.02 COMPOSITION/RESILIENT FLOORING **(CSI** 09650)

PROBABLE FAILURE POINTS

- Amount and type of pedestrian traffic.
- Vehicular traffic (e.g., carts, wheel chairs)
- Exposure to stains and cigarette burns that are capable of staining, softening, or otherwise damaging flooring.
- Exposure to in-surface damage such as cuts, tears, punctures, permanent surface indentations, and gouges.
- Seams improperly set
- Door or deteriorated substrate leading to lifting, mastic flow at seams, uneven wear.

SYSTEM ASSEMBLIES/DEFICIENCIES

Abrasion:	Contact with moving parts.
Staining:	Discoloration caused by other foreign material.
Tearing :	Objects passing across the surface of the flooring.
Heat Aging:	Direct sunlight affects the surface by ultra-violet rays.
Adhesion:	Lack of adhesion causing flooring to uplift. Oils, grease, and paint on old floors can all prevent bonding of adhesive to concrete.
Loose Seams:	Pedestrian/vehicular traffic (e.g., carts, wheel chairs).
Excessive Ridging:	Unevenness in the finish substrate below the composite/resilient flooring.
Excessive Moisture:	Mold growth in floor.
Alkaline Salt:	Can destroy the bond and leave salt deposits in cracks in the tile.
Black Marks.	Exposure to environmental abuse by shoes, furniture, etc.
Edge Curing:	Exposed to an excessive amount of moisture.

DEFICIENCY FACTORS
0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	DAMAGED COMPOSITION TILES		
FLOOR FINISHING SYSTEMS COMPOSITION/RESILIENT FLOORING (CSI 09650)	Revision No.	Issue Date 5/93	Drawing No. D060702-1

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	WATER STAINED COMPOSITION TILE		
FLOOR FINISHING SYSTEMS **COMPOSITION/RESILIENT FLOORING** **(CSI 09650)**	Revision No.	Issue Date 5/93	Drawing No. D060702-2

DEFICIENCY FACTORS
0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

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DEFICIENCY FACTORS
0.06.07.02 COMPOSITION/RESILIENT FLOORING (CSI 09650)

END OF SUBSECTION

0.06.07.03 FLOOR (CONCRETE) (CSI 03300)

DESCRIPTION

Concrete can be finished in a variety of ways. A rough form finish shows the pattern of the formwork and joints between forms. This is the roughest finish and is usually used for concrete that will not be visible.

Smooth form finish is similar, but smooth forms made of wood, metal, or hardboard are used. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Concrete Floor Finishes (CSI 03300)

Architectural Finishes:

These finishes are used where concrete will be exposed and appearance is a consideration. There are several varieties.

- Form Liners: the concrete is shaped with plastic, wood, or metal liners. Parallel rib liners are common types. Joints and form tie holes are threaded as desired, either left exposed or patched.
- Scrubbed: the surface of the concrete is wetted and scrubbed with a wire or fiber brush to remove some of the surface mortar and expose the course aggregate.
- Acid Wash: the surface of the concrete is wetted with muriatic acid to expose and bring out the full color of the aggregate.
- Water Jet: a high-pressure water jet mixed with air is used to remove some of the mortar and expose the aggregate.

Tool & Sandblasted Finishes:

Tooled finishes are produced by mechanically modifying the concrete surface.

- Bush Hammering: a bush-hammered finish gives a rugged, heavy texture by removing a portion of the surface made with form liners. The type of texture depends on the form liner used.
- Grinding: this finishing technique smooths out the surface of the concrete. It is similar to terrazzo in appearance.

Architectural Finishes:

- Applied: applied finishes entail applying other materials, such as plaster, to the concrete.
- Sandblasted: these finishes are produced by removing surface material from the concrete to expose the fine and course aggregate to varying degrees, depending on whether the sandblasted finish is specified as light, medium, or heavy.

Rubbed Finishes:

- Smooth: the surface of the concrete is wetted and rubbed with a corborundum brick to produce a smooth, uniform color and texture.
- Grout Cleaned: grout is applied over the concrete and smoothed out, resulting in a uniform surface with concealed defects.

0.06.07.03 FLOOR (CONCRETE) (CSI 03300)

Special Concrete Coatings (CSI **09800)**

In preparing concrete for coating, foreign matter must be carefully removed. Detergent will remove oils, dust, dirt, and similar surface contaminants, Two coatings need to be addressed. Where floor surfaces are to be coated, there must be an optimum bonding due to abrasion. Because of their ability to resist severe conditions, certain coatings used on submerged surfaces require excellent surface preparation because of their weaker bonding qualities. Surfaces requiring more attention to surface preparation are etched with muriatic acid solution remove any slick surface and laitance to provide a clean, rough surface for a better mechanical bond.

Epoxy Coatings:

Epoxy resin use has increased due to excellent adhesion, toughness, and chemical resistance. They are used as chemical-resistant coatings, weather and water-resistant marine finishes, and abrasion and corrosion-resistant coatings for industrial equipment.

Polyester Coatings:

The term “polyester” is commonly used to denote a tile-like coating which is hard, non-porous, durable, capable of withstanding dilute alkalis and acids, organic solvents, hot water, and high order or nuclear radiation, as well as ordinary mechanical abuse, impact, and abrasion.

Polyester Coatings:

Polyester resin coatings include hard lustrous clear finishes, colored coatings for exteriors of concrete or masonry structures; tough impact and abrasion-resistant coatings for corridor walls and floors of schools and hospitals; sanitary coatings for cafeterias and hospitals; radiation-resistant coatings for nuclear installation; tough wear-resistant coatings for stairways, bowling alleys, and gymnasium floors; and industrial coatings for metal structures and equipment.

Polyurethane coatings are available as either two-component systems that are mixed shortly before use and cure by direct cross-linking, or as single-package materials that cure when exposed as a film to moisture, oxygen, or heat. Polyurethane coatings formulated for optimum performance are characterized by an outstanding combination of properties, including hardness with flexibility, high-gloss, and excellent resistance to abrasion and chemicals.

OTHER RELATED COMPONENTS

Refer to Substructure and Superstructure, Volumes 2 and 3, for additional deficiencies that may impact this system.

DEFICIENCY FACTORS
0.06.07.03 FLOOR (CONCRETE) (CSI 03300)

PROBABLE FAILURE POINTS

- Lack of curing will increase the degree of cracking within a concrete structure.
- Reinforcement corrosion is an electro-chemical process that occurs in the presence of air and moisture.
- A number of deleterious chemical reactions may result in concrete cracking. These reactions may be due to the aggregate used to make the concrete or materials that come into contact with it after it has hardened or cured.
- A wide variety of poor construction practices can result in cracking in concrete or masonry structures, especially adding water to concrete to Improve workability. Added water has the effect of reducing strength, increasing deformation, and increasing ultimate drying shrinkage.
- Construction overloads induced during construction can be far more severe than those experienced in the lifetime of the structure. Unfortunately, these conditions may occur at early ages when the concrete is most susceptible to damage and often result in cracks.
- Externally applied loads are known to induce tensile stresses that result in concrete cracks Current ACI 318 design procedures use reinforcing steel, not only to carry the tensile forces, but to obtain both an adequate crack distribution and reasonable limit on crack width.

SYSTEM ASSEMBLIES/DEFICIENCIES

Poor Surface Preparation:	Dirt, grease, moisture, mill scale rust, concrete dust, or other foreign material.
Spalling:	Concrete fragments have been broken from the surface, due to reinforcement corrosion.
Settlement:	Solid particles sink in fresh concrete, after placement and before initial set.
Exposed Reinforcing:	Insufficient steel cover. Concrete quality. Calcium chloride overused as admixture.
Alkali-Aggregate Expansion:	Chemical reaction between aggregate and cement paste causing separation and bond break-up.
Cracking (Active and Dormant):	Construction movement, settlement, shrinkage around reinforcement. Settling due to inadequate finishing and curing. Chemical reactions such as corrosion. Physical reactions such as drying shrinkage. Thermal changes (subjected to temperature extremes such as from freeze/thaw cycles). Stress concentration. Structural design. Accidents from overload, vibration, fatigue, and earthquake.
Crazing:	Surface shrinkage more rapid than interior of concrete mass. Too high a slump. Too rich a mix. Poor timing on finishing. Too rapid absorption of moisture.
Holes (Small and Large):	Chemical reaction. Inadequate construction and design.

DEFICIENCY FACTORS
0.06.07.03 FLOOR (CONCRETE) (CSI 03300)

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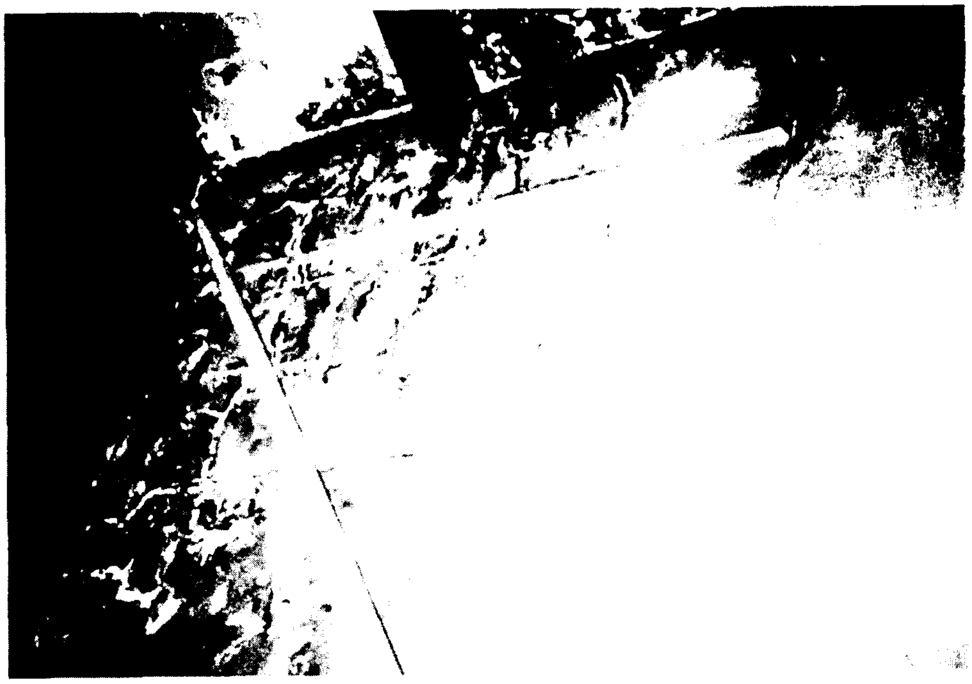

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	DAMAGED CONCRETE FLOORING		
FLOOR FINISHING SYSTEMS FLOOR (CONCRETE) (CSI 03300)	Revision No.	Issue Date 5/93	Drawing No. 0060703-I

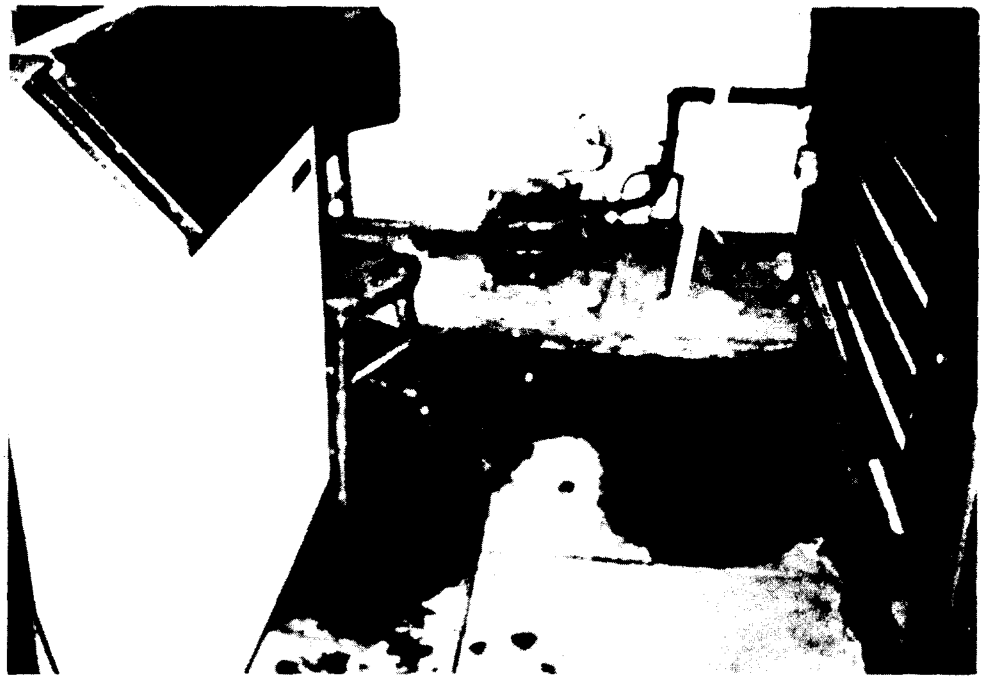

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	WATER DAMAGED CONCRETE FLOORING		
FLOOR FINISHING SYSTEMS FLOOR (CONCRETE) (CSI 03300)	Revision No.	Issue Date 5/93	Drawing No. D060703-2

DEFICIENCY FACTORS
0.06.07.03 FLOOR (CONCRETE) (CSI 03300)

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DEFICIENCY FACTORS
0.06.07.03 FLOOR **(CONCRETE) (CSI 03300)**

END OF SUBSECTION

0.06.07.04 TERRAZZO (CSI 09400)

DESCRIPTION

Terrazzo is a composite material poured in place or precast used primarily for floors and stairs. It consists of marble, quartz, granite, or other suitable chips in a bonding matrix that is cementitious, chemical, or a combination of both. Terrazzo is poured, cured, and then ground.

Terrazzo has many of the same advantages of tile, which includes durability, water resistance, ease of cleaning, a wide choice of patterns and colors, and fire resistance. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Terrazzo (CSI 09400)

Types of Terrazzo:

There are four basic types of terrazzo. Standard terrazzo is the most common type, using small chips no larger than 3/8 inch. Venetian terrazzo uses chips larger than 3/8 inch. Palladiana terrazzo uses thin random-fractured slabs of marble with standard terrazzo between. Rustic terrazzo has the matrix depressed to expose the chips.

An unlimited number of terrazzo finishes can be achieved by specifying various combinations of chips and matrix colors.

Installing Terrazzo:

The sand cushion method is best to avoid terrazzo cracking because the finish system is physically separated from the structural slab with a membrane. Because the underbed is reinforced, the terrazzo system can move independently of the structure. If floor movement or deflection is not anticipated, the bonded method is usually used. Where installation thickness is a problem, a monolithic or thin-set method can be employed.

Terrazzo is generally finished to a smooth surface with an 80-grit stone grinder, but it can be ground with a rough, 24-grit to achieve a more textured surface. Rustic terrazzo finish exposes some of the stone when the matrix is washed before it has set.

Precast terrazzo uses cement grout or elastomeric sealants, the most common materials for joint work. Epoxy grout, while highly resistant to physical and chemical abuse, may cause smaller precast units to crack because of its high tensile and bond strength.

Cast-in-Place Terrazzo:

Cast-in-place terrazzo flooring provides the best insurance against cracking and general failures because an integral surface is formed independent from the floor structure. It consists of a 1/16-inch sand-cushion under an isolation member, an isolation membrane, followed by a 2-inch (3/4-inch if Venetian) terrazzo topping.

Thin-set terrazzo is thinner than monolithic terrazzo and comprises terrazzo systems having a synthetic (polyester or epoxy) matrix or polyacrylate-modified cementitious matrix.

Precast Terrazzo:

Precast terrazzo provides the advantages of quality control in forming, curing, and surfacing operations.

0.06.07.04 TERRAZZO (CSI 09400)

Factory Process Advantages:

- Control of terrazzo quality
- Smoother surfaces and machine grinding.
- Less chance of site cracking.
- Casting can occur under all weather conditions.
- Better curing protection.
- Weather does not effect cured terrazzo at installation.

Terrazzo Accessories:

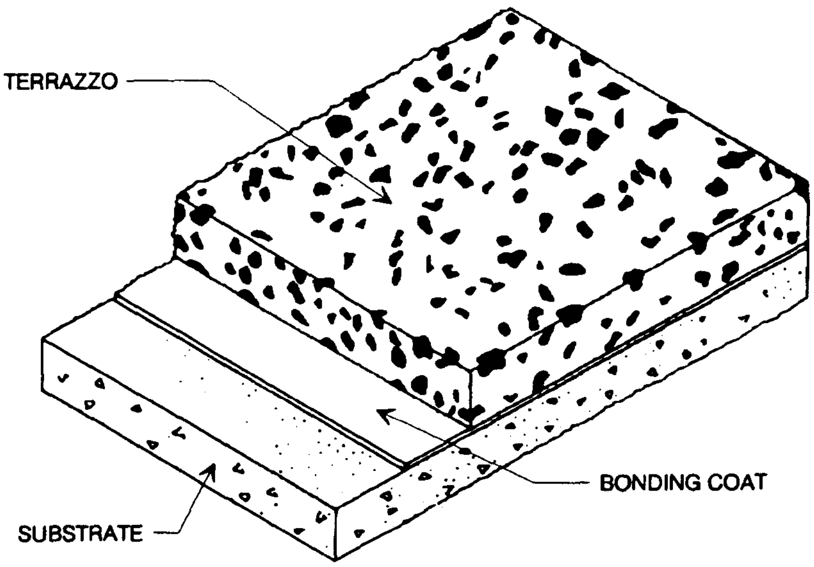
Divider strips and control expansion strips must be properly located: they are the prime factor in eliminating systemic cracking. To preclude such structural cracks in terrazzo, the dividers should be located directly over the edge of major beams and girder, and centered over other beams and joists where building expansion joints are located.

The following are the most common strip types available:

- 1 l/Cinch standard divider strip with anchoring device manufactured of white zinc alloy or brass and used primarily in sand cushion installation systems.
- 1 1/4-inch heavy top divider strips with anchoring device manufactured of white zinc alloy or galvanized steel. Basic use is the same as the standard strip
- T- or L-strips in standard gauges or with the heavy top feature are used in monolithic or resinous "thin-set" systems. Sizes vary with the depth of the terrazzo topping. It can be attached to substrate with nails or adhesive.
- T-strip constructed of folded single section of metal is effective in allowing for subfloor shrinkage at construction joints. Used mainly in monolithic terrazzo system.

OTHER RELATED COMPONENTS

Refer to Substructure and Superstructure, Volumes 2 and 3, for additional deficiencies that may impact this system.



SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**TERRAZZO FLOORING**		
FLOOR FINISHING SYSTEMS **TERRAZZO (CSI 09400)**	Revision No.	Issue Date 5/93	Drawing No. A060704-1

DEFICIENCY FACTORS
0.06.07.04 TERRAZZO (CSI 094001

PROBABLE FAILURE POINTS

- Chipping and cracking caused by overloading to terrazzo flooring, settlement of floor foundation.
- Divider strip missing/deteriorated due to faulty installation and corrosion.
- Dusting caused by improper installation, worn surface seal.
- Crumbling caused by overloading, lack of curing time.

SYSTEM ASSEMBLIES/DEFICIENCIES

Damaged/Missing Section:	Broken/damaged, cracked, or missing unit or section.
Staining/Acid Damage:	Surface discoloration iof the terrazzo from foreign substance or material, acid exposure.
Cracks :	Stress concentration, excessive overload, structural design, floor foundation settlement.
Divider Strips:	Missing; crumbling at the edges or divider stripcorrosion
Powdering/Dusting:	Improper installation, worn surface seal.

DEFICIENCY FACTORS
0.06.07.04 TERRAZZO (CSI 09400)

END OF SUBSECTION

0.06.07.05 CORK TILE (CSI 09650)

DESCRIPTION

Cork tile flooring is used where acoustical control or resilience is desired. However, it is not resistant to staining, moisture, heavy loads, or concentrated foot traffic. It should only be used above grade and must be sealed and waxed to protect the surface. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Cork Tile (CSI 09650)

Cork tile is composed of compressed granulated cork bonded with a heat-processed resinous binder. The surface may be finished with wax, lacquer, or resin. Thicknesses of 1/4 inch and 1/2 inch are available on special order. In addition to the standard 9 x g-inch, the following sizes are available:

- 6 x 6-inch
- 6 x 12-inch
- 12 x 12-inch
- 12 x 24-inch
- 36 x 36-inch

Edges may be beveled or square. Excellent resilience and most comfortable (and quiet) of all resilient floors. It is not recommended for heavy traffic locations.

Vinyl-Faced Cork Tile:

Vinyl-faced cork tile has a wearing layer of clear vinyl sheet fused by heat and pressure to regular cork tile. It is available in the same sizes as regular cork tile and in thicknesses of 1/8 inch and 3/16 inch with square or beveled edges. It provides comfort, warmth, quietness, alkali resistance, and ease of maintenance, and is excellent in grease resistance. Vinyl-faced cork tile is usually found in commercial spaces subject to moderate or heavy traffic.

Adhesive:

Adhesives are an important factor in the life of a resilient floor. They also affect the ease of application and later removal. The selection of an adhesive is based on the type of subfloor, location of subfloor with reference to moisture, type of underlayment used, and the probability of surface moisture.

OTHER RELATED COMPONENTS

See the following subsections for related components:

0.06.07.05 CORK TILE (CSI 09650)

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SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	CORK TILE		
FLOOR FINISHING SYSTEMS CORK TILE (CSI 09650)	Revision No.	Issue Date 5/93	Drawing No. A060705-1

DEFICIENCY FACTORS
0.06.07.05 CORK TILE (CSI 09650)

PROBABLE FAILURE POINTS

- Crumbling tiles caused by vehicular traffic, excessive wear.
- Delaminating/separating from substrate.
- Missing tile caused by excessive wear and removal.
- Amount and type of pedestrian traffic.
- Vehicular traffic (e.g., carts, wheel chairs)
- Exposure to stains and cigarette burns that are capable of staining, softening, or otherwise damaging flooring.
- Exposure to in-surface damage such as cuts, tears, punctures, permanent surface indentations, and gouges.
- Seams improperly installed creating premature wear.
- Improper installation creating ridging, uneven wear, etc.

SYSTEM ASSEMBLIES/DEFICIENCIES

Abrasion:	Contact with moving parts.
Tearing:	Objects passing across the surface of the tile.
Adhesion:	Lack of adhesion causing tile to come apart at the seams.
Loose Seams:	Pedestrian/vehicular traffic (e.g., carts, wheel chairs).
Excessive Riding:	Unevenness in the finish substrate below the tile.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Missing Tile:	Excessive wear and removal, poor installation practice
Worn Surface:	Pedestrian/vehicular traffic (e.g., carts, wheel chairs).

DEFICIENCY FACTORS
0.06.07.05 CORK TILE (CSI 09650)

END OF SUBSECTION

0.06.07.06 TILE FLOORING (CSI 09650)

DESCRIPTION

Ceramic tile is defined as a surfacing unit, usually relatively thin in relation to facial area, made from clay or a mixture of clay and other ceramic materials, having either a glazed or unglazed face, and fired to produce specific physical properties and characteristics. Typical locations are toilet rooms, kitchens, clean rooms, and sanitary type areas. Quarry tile is glazed or unglazed tile made by an extrusion process using natural clay or shale.

Tile Installation:

Tile must be installed on firm, solid, flat substrates capable of supporting the weight of the material. The traditional method of installing tile is to lay it in a thick bed of mortar, both on floors and walls. This is still the preferred method for quality installations and wet locations such as shower rooms, pools, and steam rooms. Tile may also be installed with the thin-set method using a thin layer of latex-Portland cement mortar or other adhesive. Thin-set is descriptive of bonding materials for tile which are applied in a layer approximately 1/8 inch or 3mm thick.

Graphic assembly details which follow illustrate general component assembly types only and not meant as a definitive, exhaustive, in-depth system breakdown; field conditions will vary and are subject to project type, local requirements and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Ceramic **Tile** (CSI **09300)**

Classification of Tiles:

The United States Tile Industry classifies tile based on size: 6 square inches is mosaic tile and over 6 square inches is wall tile. Glazed and unglazed non-mosaic tile made by the extrusion method is quarry tile; glazed, and unglazed tile over 6 square inches made by the dust-pressed method is called paver tile.

Tile is often classed according to resistance to water absorption as follows:

- Non-vitreous tile: water absorption of more than 7.0 percent.
- Semi-vitreous tile: water absorption of more than 3.0 but not more than 7.0 percent.
- Vitreous tile: water absorption of more than 0.5 percent but not more than 3.0 percent.
- Impervious tile: water absorption of 0.5 percent or less.

Imported tile is classified differently than tile produced in the United States. European manufacturers classify tile according to its production method, either the dust-press or extrusion method, its degree of water absorption, its finish, and whether it is glazed or unglazed.

The classification of abrasion resistance are: Group I, light residential; Group II, moderate residential; Group III: maximum residential; Group IV, highest abrasion resistance-commercial.

Tile sizes

Standard	Glazed Wall	**Quarry**
1" x 1"		3" x 3"
2" x 2"	4 1/4" x 4 1/4"	4" x 4"
1" x 2"	6" x 6"	6" x6"
4" x 4" 4" x 2"	4' 1 1/4" x 6"	8" x 8"
Thickness 1/4"	8" x 8"	3" x 6"
	Thickness 5/16"	4" x 8"
		Thickness 1/2" to 3/4"

0.06.07.06 TILE FLOORING (CSI 09650)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS (Continued)

Glazed Wall Tiles (CSI 09300)

Glazed wall tiles are units with an impervious glazed finish usually fused to a nonvitreous body of sort whiteware with water absorption not exceeding 18 percent. This tile is not intended to withstand excessive impact or exposure to freezing and thawing. Because it has limited capability to endure abrasion and to resist food acids, it should only be used in vertical application and non-traffic applications such as counter tops that are not subject to heavy-duty use.

Unglazed Ceramic Mosaic Tiles (CSI 09300)

Unglazed ceramic mosaic tiles are small units with a facial area less than 6 square inches that are formed by either the dust-pressed or the plastic method. They may be porcelain or natural clay composition and are available with abrasive content for slip resistance. Porcelain tiles are classified as Impervious with water absorption of less than 0.5 percent. Natural clay tiles are classified as either impervious or vitreous, with the water absorption of the latter not exceeding three-percent. Porcelain units have a hardness rating of 100 and natural clay 50. Abrasion treatment will not affect appearance as it would in a glazed product. Greater strength and lower water absorption make this a durable tile that is intended for use on both exterior and interior horizontal and vertical surfaces, including floors.

Glazed Ceramic Mosaic Tiles (CSI 09300)

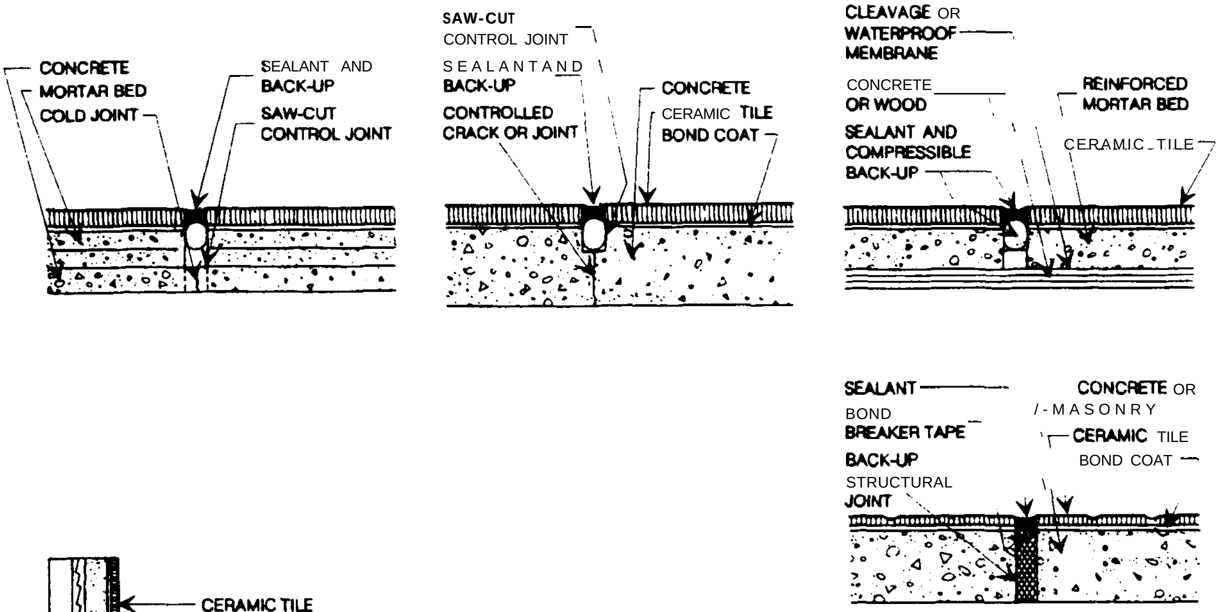
Glazed ceramic mosaic tiles are the same composition as unglazed units except that a glazed finish is fused to the body of the tile, which unlike unglazed units, is untinted. Glazed units tend to have lower values than unglazed units when tested for coefficient of friction and may not be suitable for horizontal traffic surfaces.

Quarry Tiler (CSI 09300)

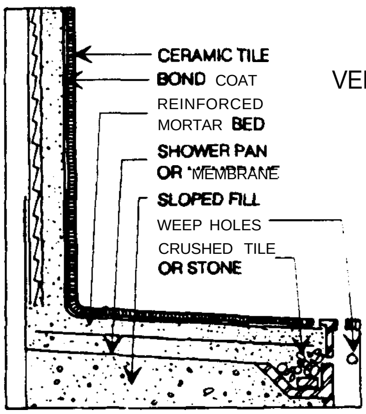
Quarry tiles are unglazed or glazed units with a facial area usually exceeding 6 square inches and a thickness of 1/2 or 3/4 inches. They are extruded from natural clay or shale. Their water absorption is 5 percent or less. Quarry tile is virtually unaffected by moisture, acid, oils, or chemicals and is intended for interior and exterior applications where tile with optimum performance characteristics is needed.

OTHER RELATED COMPONENTS

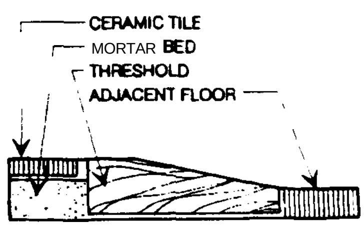
See the following subsections for related components:



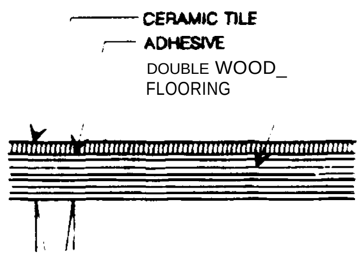
VERTICAL AND HORIZONTAL EXPANSION JOINTS



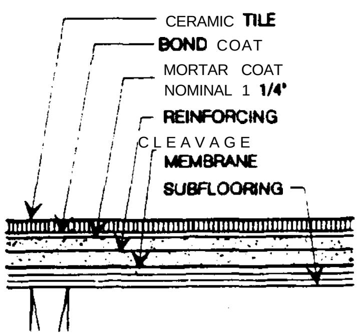
TILE SHOWER RECEPTOR



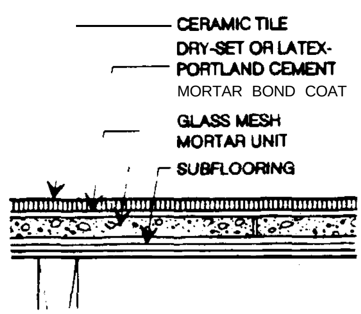
THRESHOLDS, SADDLES



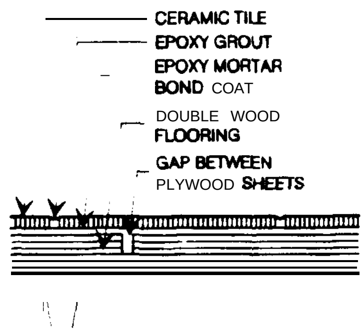
ORGANIC ADHESIVE



CEMENT MORTAR



DRY-SET MORTAR



EPOXY MORTAR AND GROUT

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**TILE FLOORING**		
FLOOR FINISHING SYSTEMS **TILE (CSI 09300)**	Revision No.	Issue Date 5/93	Drawing No. A060706-1

DEFICIENCY FACTORS
0.06.07.06 TILE (CSI 09300)

PROBABLE FAILURE POINTS

- Broken, loose tile. Inadequate subfloor, brittleness due to inadequate maintenance procedure and/or cleaning.
- Missing tile caused by brittleness, abuse
- Deteriorating adhesive caused by excessive moisture
- Water damage caused by porous surface
- Impact damage caused by tile unsuitable for exposure conditions and/or location, abuse by shoes, furniture, etc.

SYSTEM ASSEMBLIES/DEFICIENCIES

Broken/Loose Tile:	Broken/missing tile by impact damage, inadequate subfloor, soil, and traffic abrasion.
Missing Tile:	Impact, lack of grout, deteriorated grout.
Grout Deterioration:	Damaged or deteriorated joints that have fallen out or are worn down.
Impact Damage:	Depressions, dents, or buckled surface from objects striking the surface.
Water Damage:	Water leakage
Staining:	Surface discoloration from foreign substance or material
Black Marks:	Exposure to environmental abuse by shoes, furniture, etc.
cuts:	Heavy loads.
Fading:	Exposure to direct sunlight, harsh chemicals.
Edge Curing:	Excessive moisture exposure.
Darkening of Flooring:	Incomplete wax removal or excessive build-up.

DEFICIENCY FACTORS
0.06.07.06 TILE **(CSI 09300)**

END OF SUBSECTION

0.06.07.07 WOOD FLOORING (CSI 09550)

DESCRIPTION

Wood flooring offers a wide variety of appearances while providing a surface that is durable and wear resistant. It can be laid in dozens of different patterns. Wood flooring is made from both hardwood and softwood, although hardwoods predominate. It is available in several species: standard hardwoods are red oak, white oak, maple, birch, beech, pecan, mahogany, and walnut; softwoods include yellow pine, fir, and western hemlock, among others. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Wood Flooring (CSI **09550)**

Types of Wood Flooring:

There are four basic types of wood flooring. Strip flooring is one of the most common and consists of thin strips from 3/8-inch to 25/32-inch thick of varying lengths with tongue-and-groove edges. Plank flooring comes in the same thicknesses as strip, but is over 3 1/4-inches wide.

Block flooring is made of preassembled wood flooring in three basic configurations. Unit block flooring is a standard strip flooring assembled into a unit held together with steel or wood splines. Laminated block flooring is made from three to five plies of cross-laminated wood veneer. Parquet flooring is made of preassembled units or several small, thin slats of wood in a variety of patterns, finished or unfinished. Parquet flooring is usually produced in 12-inch squares for mastic applications.

The fourth type of wood floor is made from solid end grain blocks. These are solid pieces of wood from 2 1/4-inches to 4-inches thick laid on end. Solid block floors are very durable and resistant to oils, mild chemicals, and indentation. They are mainly used for industrial applications.

Grades of Wood Flooring:

Wood flooring is graded differently than other wood products. Grading rules are set by the various trade associations such as the National Oak Flooring Manufacturers Association, The Maple Flooring Manufacturers' Association, The Southern Pine Inspection Bureau, The West Coast Lumber Inspection Bureau, and The Western Wood Products Association.

Unfinished oak flooring is graded as clear, select No. 1 common and No. 2 common. Clear is the best grade with the most uniform color. Plain sawn is standard, but quarter sawn is available on special order. Piece lengths are 1 1/4-feet and up and average 3 3/4-feet.

Beech, birch, and maple are available in first, second, and third grades along with combination grade.

Finish.

Wood strip and plank flooring is usually installed unfinished for field sanding, staining, and finishing. Block flooring may come unfinished or prefinished. Parquet flooring is often impregnated with acrylic and irradiated for a very hard, durable finish. Wood may be stained and finished with wax, varnish, polyurethane, or a variety of other finishes.

0.06.07.07 WOOD FLOORING (CSI 09550)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Wood Flooring (CSI **09550)** (Continued)

Installation:

Wood flooring must be installed over a suitable, nailable base. Because wood swells when damp, provisions must be made to prevent moisture from seeping up from below and to allow for expansion of the completed floor. Strip flooring is installed by blind nailing through the tongue.

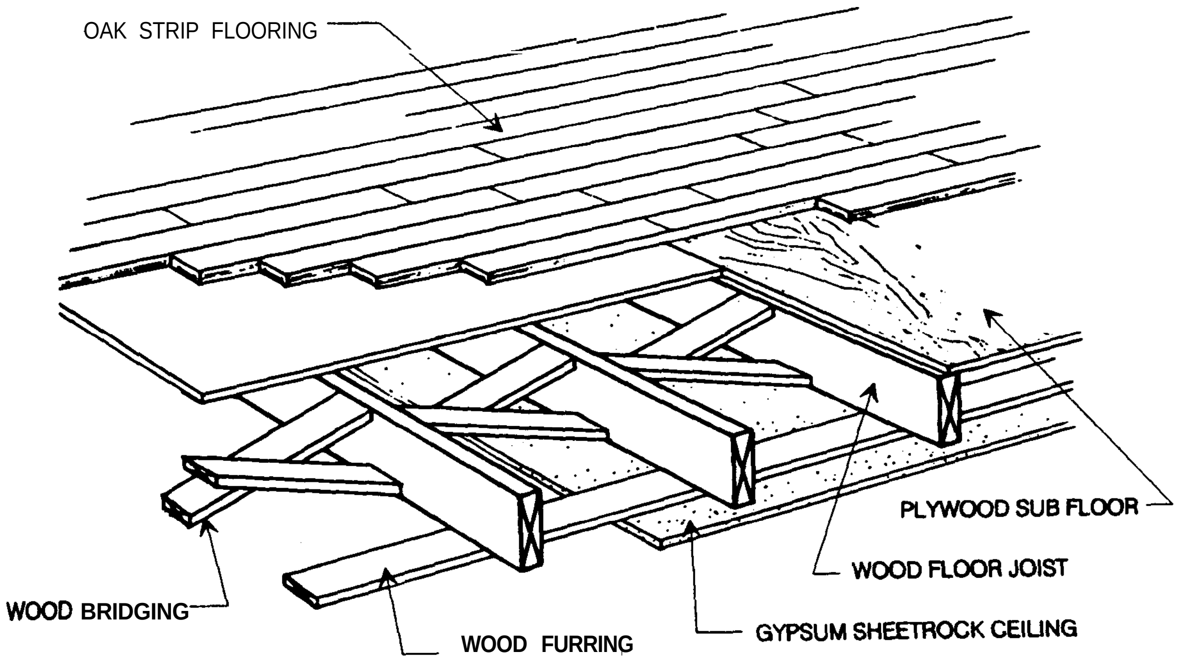
Two methods are used to install wood flooring over a concrete subfloor. A sheet of 3/4-inch plywood is attached to the concrete to provide the nailable base. A layer of polyethylene film is laid down first if moisture may be a problem. Resilient pads are also available and used in place of sleepers for strip flooring installation. These provide an even more resilient floor and are often used for dance floors and gymnasiums.

Wood flooring is laid on wood sleepers. This method not only gives a more resilient floor that is more comfortable underfoot, but it also provides an air space so any excess moisture can escape. In both instances, a gap of about 3/8-inch to 3/4-inch is left at the perimeter to allow for expansion and is concealed with the wood base.

The typical installation is over wood framing with a plywood subfloor. A layer of 15-pound asphalt felt may be laid to prevent squeaking and act as a vapor barrier.

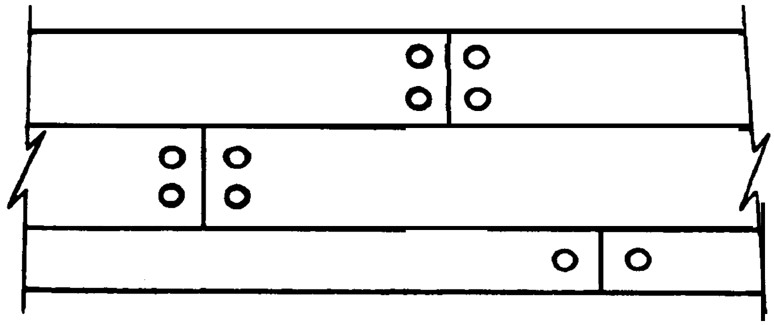
OTHER RELATED COMPONENTS

Refer to Superstructure, Volume 3, for additional deficiencies that may impact this system.

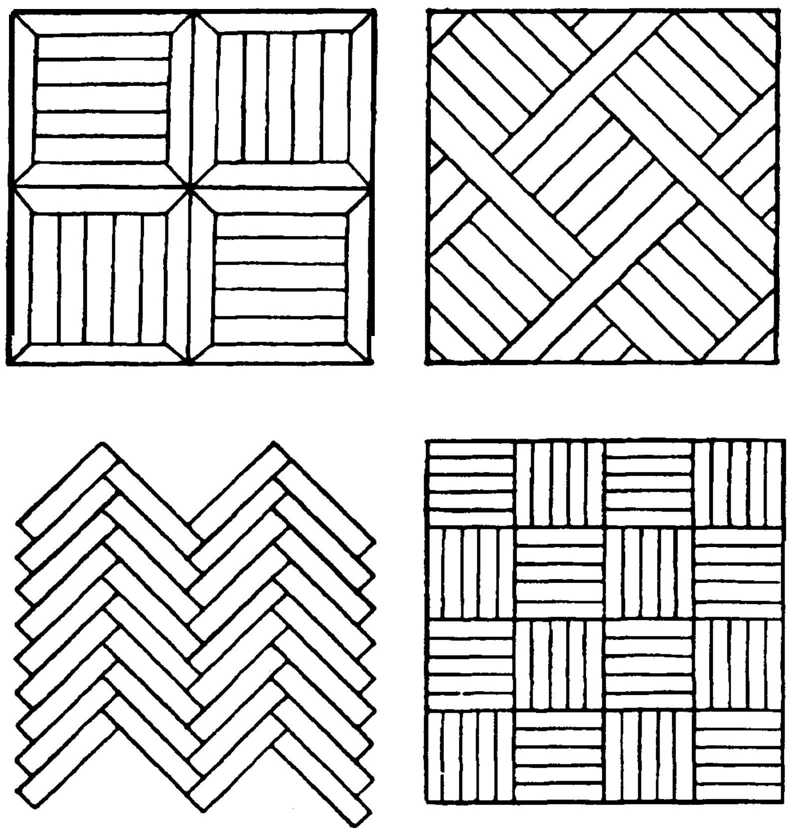


SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION FLOOR FINISHING SYSTEMS WOOD FLOORING (CSI 09550)	WOOD FLOORING		
	Revision No.	Issue Date	Drawing No.
		5/93	A060707-1



STRIP PLANK FLOORING WITH PLUGS



RANDOM PATTERNS OF PARQUET FLOORING

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**WOOD FLOORING**		
FLOOR FINISHING SYSTEMS **WOOD FLOORING (CSI 09550)**	Revision No.	Issue Date 5/93	Drawing No. A060707-2

DEFICIENCY FACTORS
0.06.07.07 WOOD FLOORING (CSI 09550)

PROBABLE FAILURE POINTS

- Improper or deteriorated substrate.
- Split, cracked flooring caused by exposure to moisture.
- Buckling due to insufficient space allowed for expansion.
- Termite and boring insect damage causing breakdown of structural integrity.
- Decay (rot) due to fungi, mildew, dry rot causing surface deterioration.
- Fire damage or charred surfaces causing flaking or surface breakdown .
- Loose flooring caused by nail popping, vibration, temperature changes, or improper tightness.
- Splitting or checking caused by stress, bending, or twisting.
- Cracking caused by stress, settlement/movement, poor materials, or improper construction.
- Impact damage caused by objects striking or impacting the surface.

SYSTEM ASSEMBLIES/DEFICIENCIES

Out-of-Alignment:	Bowing, deflection, or other movement that brings the surface out of plumb or not level in one or more directions.
Cracking:	Cracking, usually structural in nature, that results in tearing, ripping, or shearing. Cracks can be random, horizontal, vertical, or diagonal.
Surface Deterioration:	Crazing, small surface cracks, and surface breakdown due to weather, pressure, or other actions.
Staining:	Surface discoloration from a foreign substance or material.
Insufficient Anchors/Connections:	Broken, damaged, loose, corroded, or missing anchorage or fasteners caused by vibration, excessive deflection, or improper tightness.
Dry Rot/Decay:	Breakdown of structural integrity from mold/mildew or dry rot.
Loss of Protective Coating/Paint:	Chalking, peeling, chipping, blistering, or deterioration.
Splitting:	Surface splitting or tearing.
Insect Damage:	Holes, cracks, or punctures from burrowing insects.
Burned or Charred Surface:	Damage from fire or excessive heat on surface:
Missing Sections:	Rotting, missing, or deteriorated supports.

DEFICIENCY FACTORS
0.06.07.07 WOOD FLOORING (CSI 09550)

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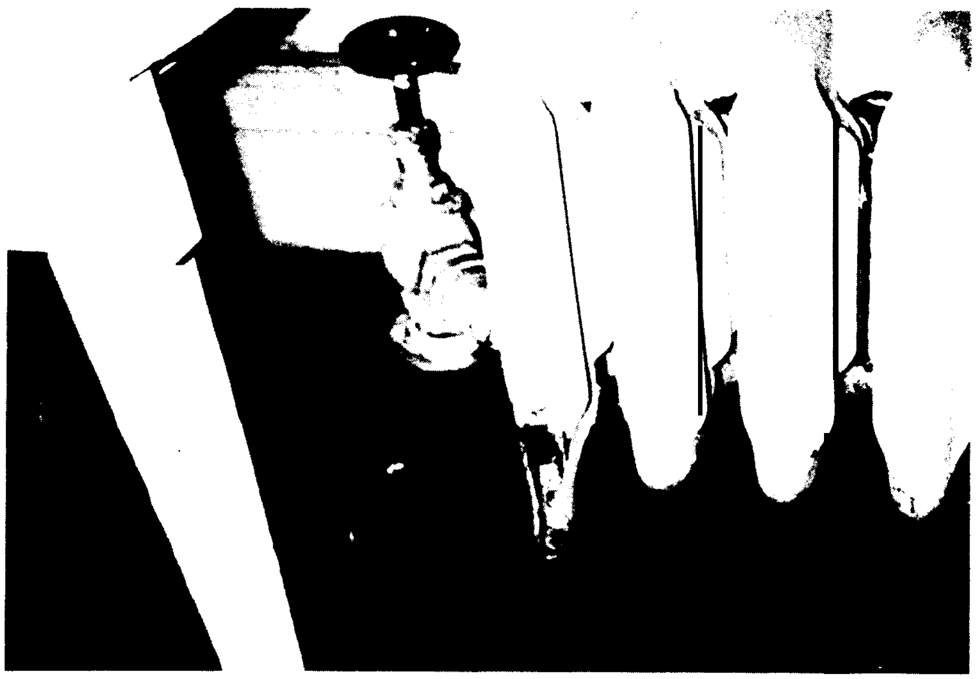

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	ROTTED WOOD FLOOR		
FLOOR FINISHING SYSTEMS WOOD FLOORING (CSI 09550)	Revision No.	Issue Date 5/93	Drawing No. 0060707-I

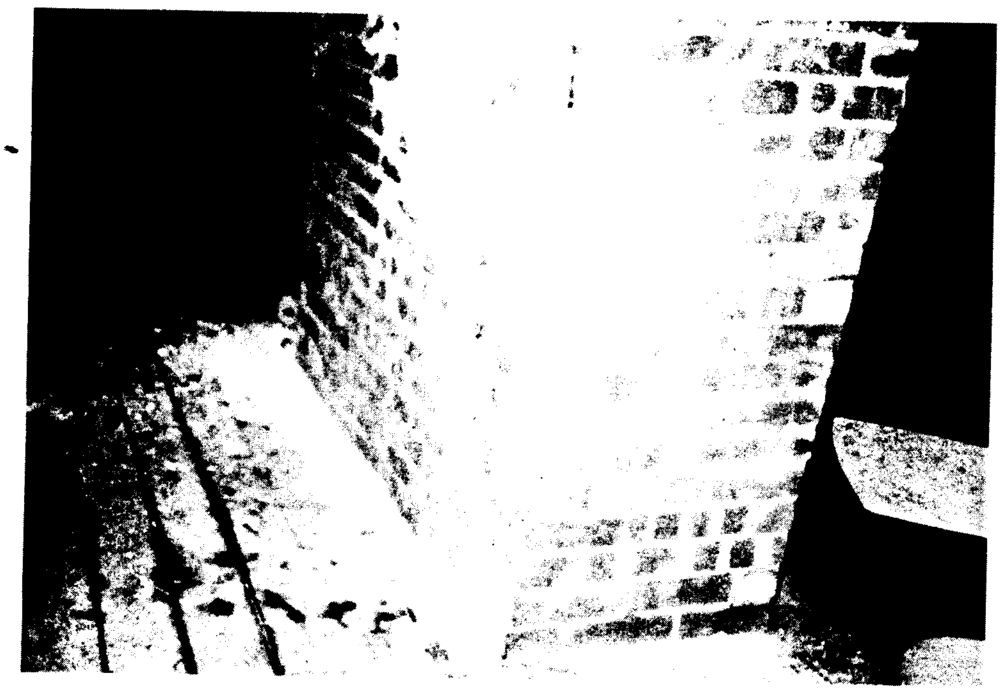

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	SEPERATION OF WOOD STRIP FLOORING		
FLOOR FINISHING SYSTEMS **WOOD FLOORING (CSI 09550)**	Revision No.	Issue Date 5/93	Drawing No. D060707-2

DEFICIENCY FACTORS
0.06.07.07 WOOD FLOORING (CSI 09550)

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DEFICIENCY FACTORS
0.06.07.07 WOOD FLOORING (CSI 09550)

END OF SUBSECTION

0.06.08.01 DRYWALL/PLASTER CEILING (CSI 09200)

DESCRIPTION

Gypsum wallboard, also known as drywall, is made of a gypsum plaster core sandwiched between sheets of paper or other materials.

Plaster is a finish material made from various types of cementing compounds, fine aggregate, and water. It is applied over several kinds of base materials in two or three coats to form a smooth, level surface. Plaster is a term commonly used for interior application. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Drywall (CSI 09200)

Drywall normally comes in 4 x 8-foot sheets, although 10 x 12-foot lengths are available; 1 - inch thick coreboard comes in 2-foot widths. Thicknesses range from 1/4 to 5/8-inch.

Drywall is available with square, tapered, and tongue-and groove edges. The tapered edge is the most commonly used because it allows joint compound and tape to be applied without showing a bulge in the finished surface.

Other types available include Type X for fire-retardant partitions, foil-backed for vapor barriers, water-resistant for use behind tile and in other moist conditions, and exterior soffit board.

Drywall is applied by nailing or screwing it to wood or metal framing, or with mastic when applying it to concrete or masonry walls. The joints are finished by embedding paper or fiberglass tape in a special joint compound and allowing it to dry.

Plaster (CSI 09200)

Plaster is made from gypsum and lime, aggregates of sand, vermiculite, perlite, and water. Vermiculite and perlite are used when a lightweight, fire-resistant plaster is needed. A special process is used to produce Keene’s cement, which is a plaster that has a high resistance to abrasion and water penetration. It is used in wet areas or on walls subject to scratching or other abuse.

There are two common methods of applying plaster; first is on metal lath attached to metal studs. Metal lath is available is several types: expended diamond mesh, paper-backed diamond mesh, flat rib lath, and high rib lath. Expended diamond lath is a general-purpose type used for both flat and curved surfaces. The paper-backed type has an asphalt-impregnated paper applied to it and is used as a base for Portland cement plaster under ceramic tile.

The other method of plastering uses gypsum board lath instead of metal lath. This is a special gypsum product specifically designed for plastering. Gypsum lath comes in 16 x 48 inch boards that are applied over the traditional method because only one coat is needed: the finish coat. In metal lath, finishing is a three-coat process. The first coat is called the scratch coat,which is typically followed by a brown coat and then the final finish coat. The scratch and brown coat are about 1/8-inch thick.

Plaster edges must be finished with various types of metal trim pieces. These provide a termination point for the work and serve as screeds to give the plasterers guides for maintaining the required thickness. Common profiles include corner beads to protect outside corners, casing beads to trim doors and other openings, and expansion joints to control cracking plaster.

0.06.08.01 DRYWALL/PLASTER CEILING (CSI 09200)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS (Continued)

Framing (CSI **6200/9200)**

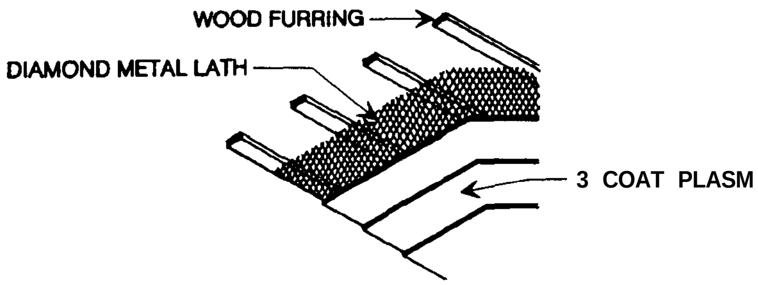
Gypsum wallboard and plaster are attached to various types of framing. Wood joist, rafters, and trusses may be fabricated in standard lengths and various configurations. Wood ceiling framing may be clad with drywall, plaster, composition board. (Primarily residential construction.)

Metal ceiling runners or C-shaped channels are formed or fabricated from light-gauge metal in standard lengths and various widths and configurations. C-studs are available in 14, 16, and 18 gauge, in depths varying from 1-5/8 to 12-inches. Hat-shaped furring channels are used for ceiling framing, and resilient channels are used to improve the acoustical properties.

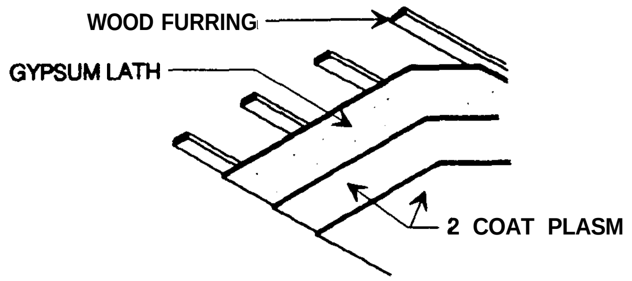
OTHER RELATED COMPONENTS

See the following subsections for related components:

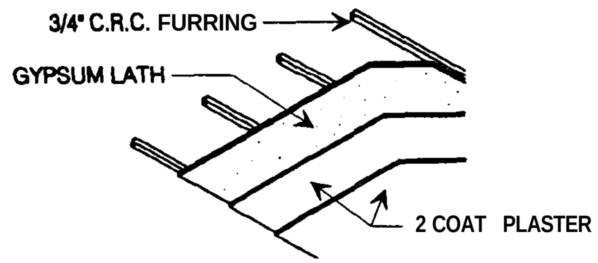
0.06.05 Paints/Finishes/Coatings 2.5-l



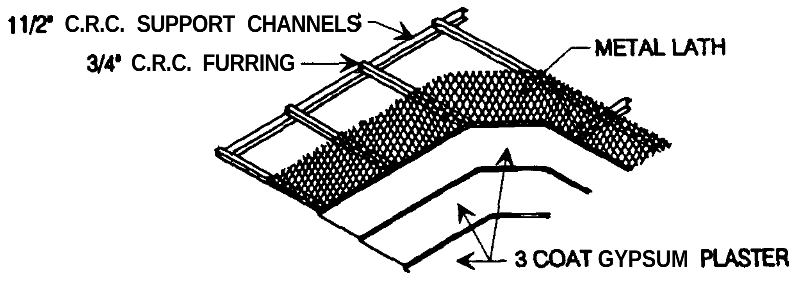
PLASTER ON METAL LATH AND WOOD FURRING



PLASTER ON WOOD FURRING



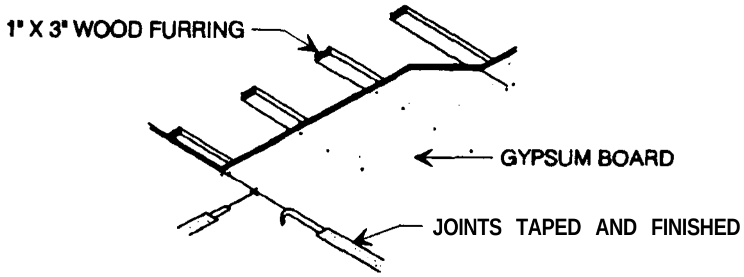
PLASTER ON METAL FURRING



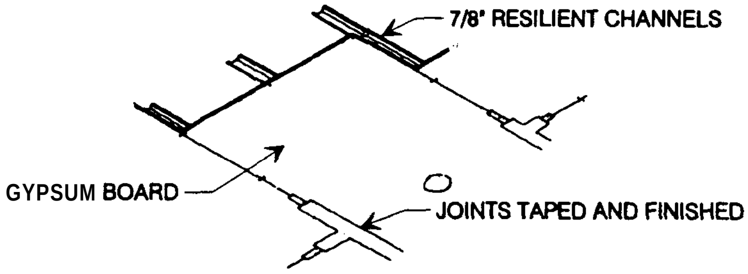
PLASTER ON METAL LATH

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

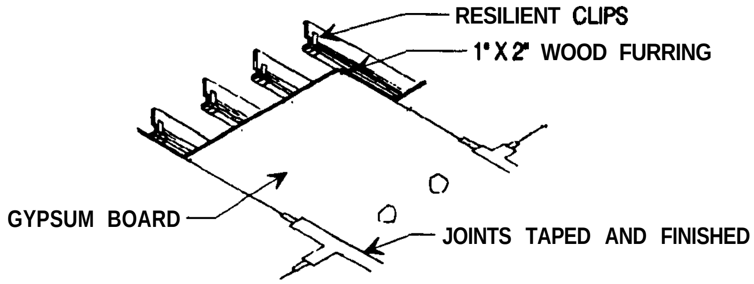
SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	PLASTER CEILING		
CEILING SYSTEMS DRYWALL/PLASTER (CSI 09200)	Revision No.	Issue Date 5/93	Drawing No. A060801-1



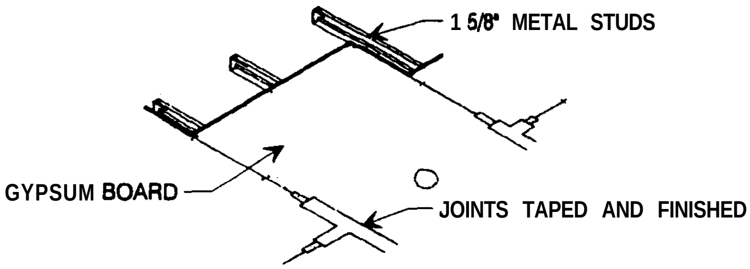
GYPSUM BOARD ON 1' X 3' WOOD FURRING



GYPSUM BOARD ON 7/8" RESILIENT CHANNEL FURRING



GYPSUM BOARD ON 1" X 2", SUSPENDED, WITH RESILIENT CLIPS



GYPSUM BOARD ON 1 5/8" METAL STUD FURRING

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	DRY WALL CEILING		
CEILING SYSTEMS DRYWALL/PLASTER (CSI 09260)	Revision No.	Issue Date 5/93	Rawhg No. A060801-2

DEFICIENCY FACTORS
0.08.08.01 DRYWALL/PLASTER CEILING (CSI 09200)

PROBABLE FAILURE POINTS

- Dampness/wetness caused by condensation or exterior leakage.
- Exposure to in-surface damage such as cuts, tears, punctures.
- Surface indentations and gauges.
- Improper fastening causing nail pops.
- Corroded nails or screws causing drywall stains.
- Improper joint finishing.
- Long run of ceiling caused by expansion joint causing cracks.
- Metal lath corrosion causes plaster to stain, crack, and shift.
- Inadequate mixture of plaster causing spalling.
- Lack of curing time.

SYSTEM ASSEMBLIES/DEFICIENCIES

Drywall/Plaster

Water Damage:	Roof leakage, sprinkler system malfunction.
Improper Joint Finishing:	Inadequate construction.
Nail Popping:	Wall movement, improperly attached walls.
Impact Damage:	Depressions, dents, holes/punctures, or buckled surface from objects striking or impacting the surface.
Cracking:	Stress concentration, structural settlement, excessive overload on ceiling.
Missing Sections:	Improper installation.

DEFICIENCY FACTORS
0.06.08.01 DRYWALL/PLASTER CEILING (CSI 09200)

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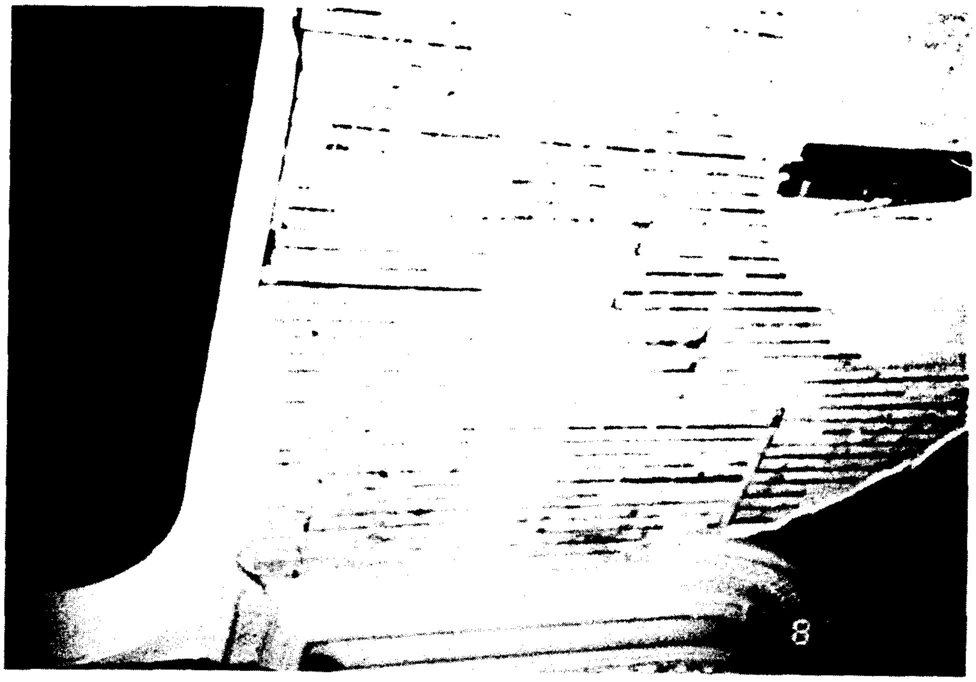


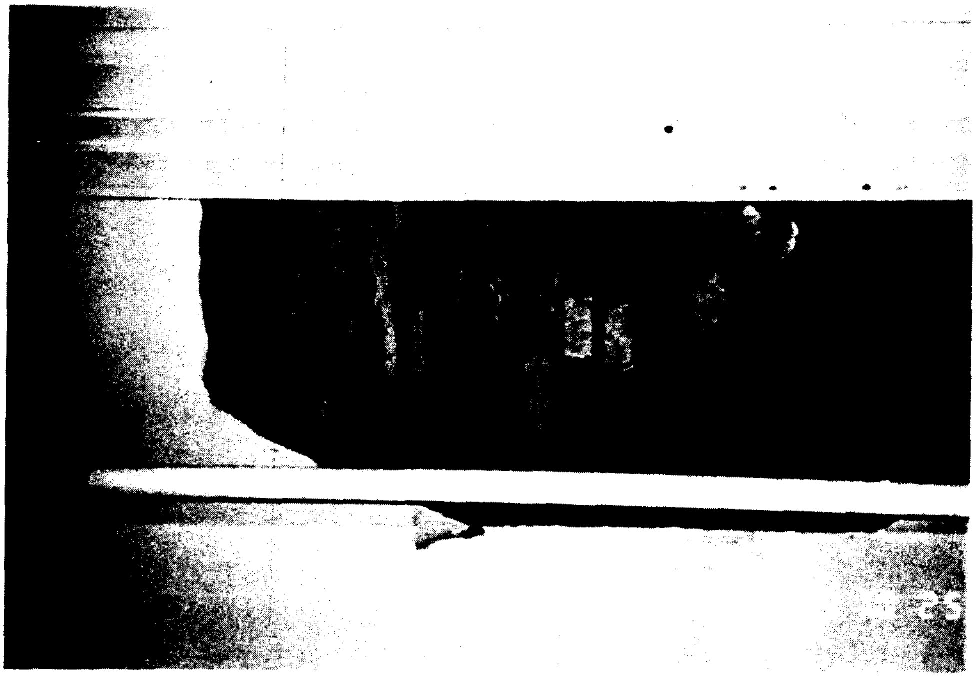
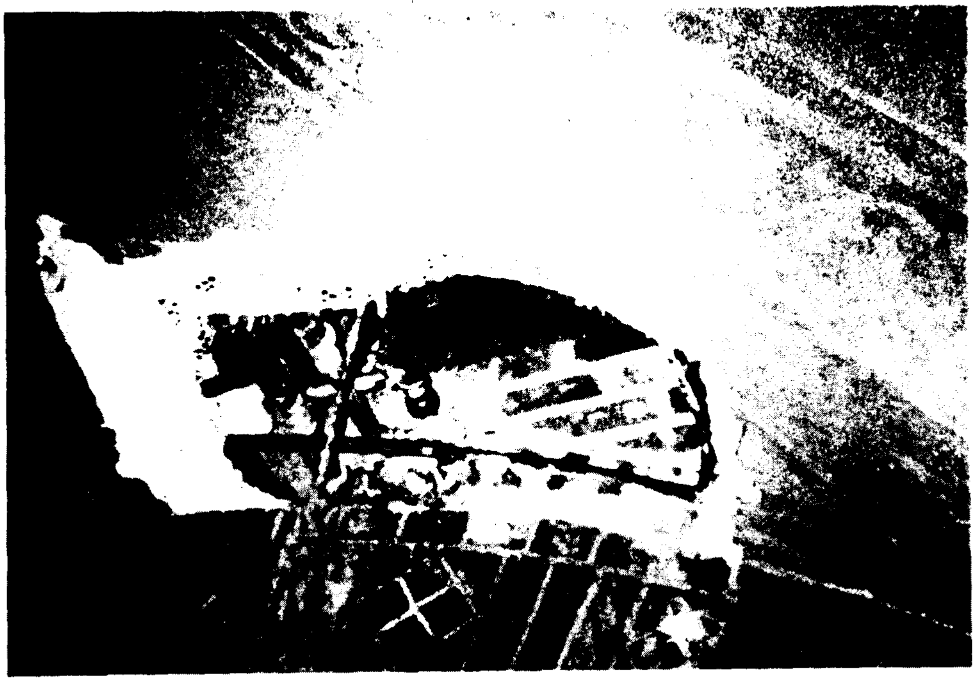


PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	DAMAGED PLASTER/WOOD LATH		
CEILING SYSTEMS DRYWALL/PLASTER (CSI 09200)	Revision No.	Issue Date 5/93	Drawing No. D060801-1



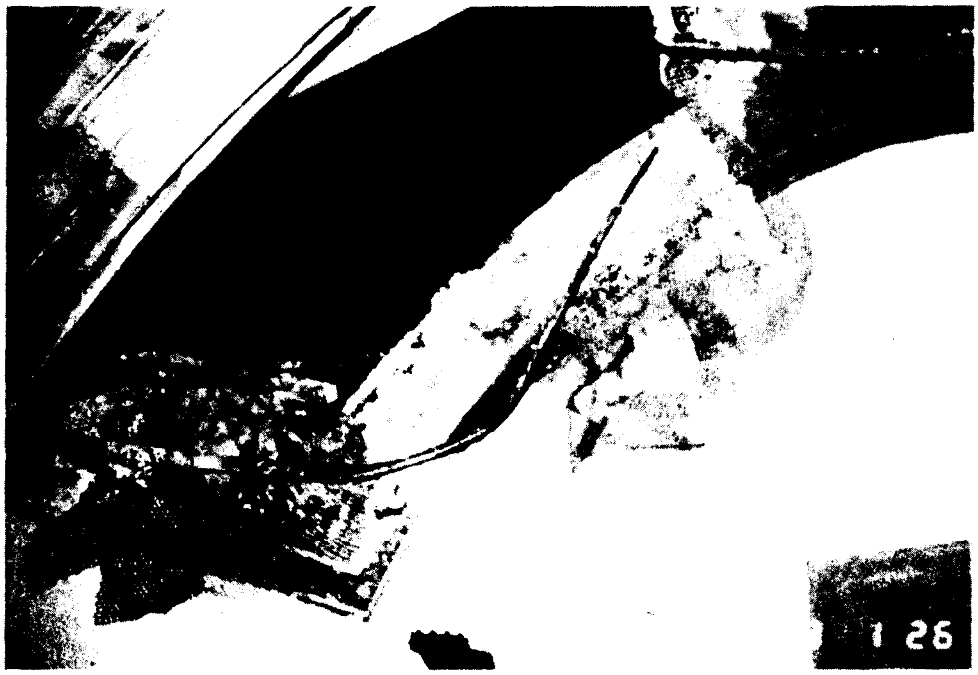


PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	DAMAGED PLASTER/METAL LATH		
CEILING SYSTEMS DRYWALL/PLASTER (CSI 09200)	Revision No.	Issue Date 5/93	Drawing No. D060801-2

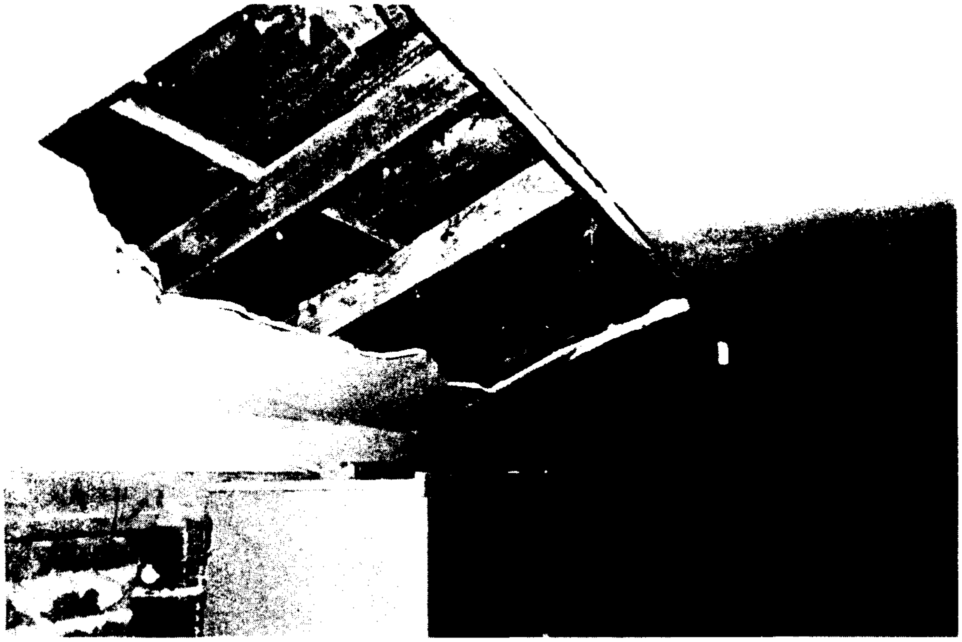


PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	DAMAGED DRYWALL		
CEILING SYSTEMS DRYWALL/PLASTER (CSI 09250)	Revision No.	Issue Date 5/93	Drawing No. D060801-3

DEFICIENCY FACTORS
0.06.08.01 DRYWALL/PLASTER CEILING (CSI 09200)

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DEFICIENCY FACTORS
0.08.08.01 DRYWALL/PLASTER CEILING (CSI 09200)

END OF SUBSECTION

0.06.08.02 ACOUSTICAL (INCLUDING GRID) (CSI 09500)

DESCRIPTION

Acoustical ceilings serve many purposes in today's construction. In contemporary commercial construction, the ceiling is almost always a system separate from the structure. In addition to acoustical control, many elements must be coordinated in selection and detailing, including: determining required clearances for recessed lights; verifying clearances for duct work; locating sprinklers, fire alarm speakers, smoke detectors, and similar items; and drapery pockets and other recessed fixtures. The space above an acoustical ceiling is used for mechanical systems, wiring, and other services. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Acoustical Ceiling (CSI 09500)

Acoustical ceilings consist of thin panels of wood fiber, mineral fiber, or glass fiber set in a support grid of metal framing that is suspended by wires from the structure above. The tiles are perforated or fissured in various ways to absorb sound, which is the basic for the term acoustical ceiling. It is important to remember that acoustical ceilings absorb sound, but they do not prevent sound transmission to any appreciable extent.

Acoustical ceiling tiles and the metal supporting grid are available in a variety of sizes and configurations. The most common type is the lay-in system in which tiles are simply laid on top of an exposed T-shaped grid system. A variation of this is the tegular system that uses tiles with rabbeted edges. Systems are also available in which the grid is completely concealed.

Lay-in acoustical ceiling systems are available in common sizes of 2 x 2-foot, 1 x 2-foot, and 2 x 4-foot. Specialty sizes are available such as 20 x 60-inch system, used in buildings with a 5-foot working module. This allows partitions to be laid out on the 5-foot module lines without interfering with special 20 x 48-inch fixtures located in the center of a module.

Acoustical ceilings may be rated or non-rated. If they are fire rated, it means that they are part of a complete floor-ceiling or roof-ceiling assembly that is rated. Ceiling systems ihemselves cannot be rated. Rated acoustical ceiling systems consist of rated mineral tiles and rated grid systems, which include hold-down clips to keep the tiles in place and expansion slots to allow the grid to expand if subjected to heat.

OTHER RELATED COMPONENTS

See the following subsections for related components:

0.06.08 Ceiling Systems 2.8.1-l

0.06.08.02 ACOUSTICAL [INCLUDING GRID) **(CSI** 09500)

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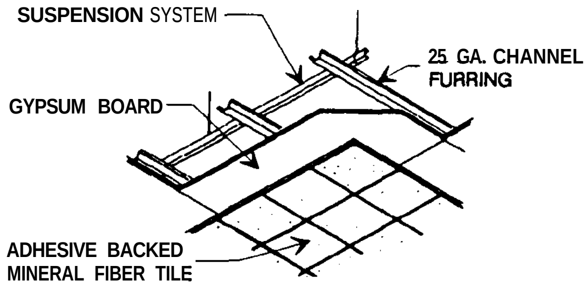
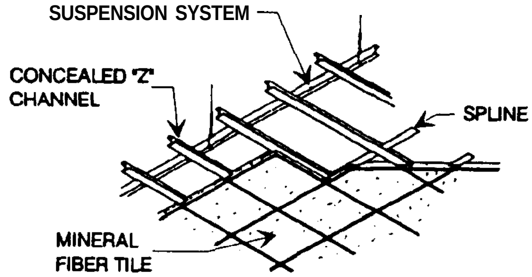
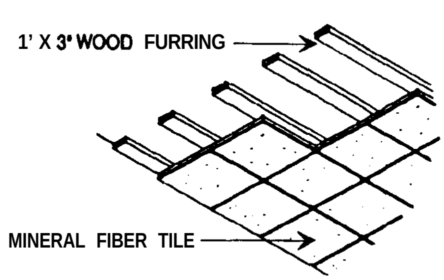


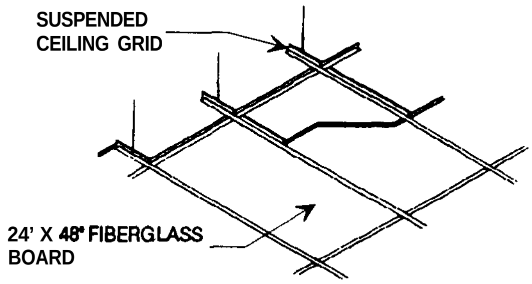
ACOUSTICAL MINERAL FIBER TILE ON GYPSUM BOARD



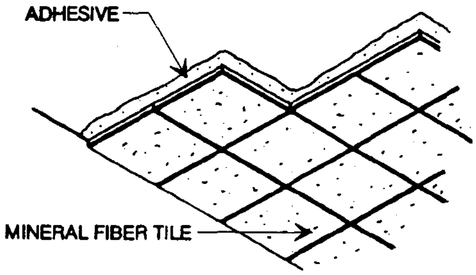
MINERAL FIBER TILE ON CONCEALED "Z" CHANNEL



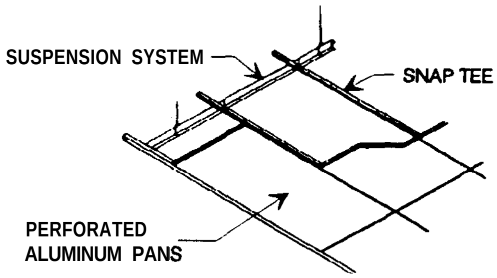
ACOUSTICAL MINERAL FIBER TILE ON 1" X 3' WOOD FURRING



FIBERGLASS BOARD ON SUSPENDED GRID SYSTEM



MINERAL FIBER TILE APPLIED WITH ADHESIVE



ACOUSTICAL PERFORATED METAL PANS

SOURCE: MEANS GRAPHIC CONSTRUCTION STANDARDS, 1ST EDITION., "R.S. Means Co., Inc., Kingston, Massachusetts"

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	ACCOUSTICAL CEILING		
CEILING SYSTEMS ACOUSTICAL(INCLUDING GRID) (CSI 09510,09130)	Revision No.	Issue Date 5/93	Drawing No. A060802-1

DEFICIENCY FACTORS
0.06.08.02 ACOUSTICAL (INCLUDING **GRID) (CSI** 09500)

PROBABLE FAILURE POINTS

- Missing tile: fallen and not replaced.
- Support/suspension system loose, broken caused by improper installation.
- Water damaged caused by leaking subsystem, condensation from plumbing pipes.

SYSTEM ASSEMBLIES/DEFICIENCIES

Water Damage:	Roof leakage, sprinkler system malfunction.
Holes/Punctured/Cracked:	Impact damage.
Missing Ceiling Grid:	Poor construction installation.
Deteriorated Ceiling Grid:	Water damage.
Missing Tile:	Improper installation, removed and never replaced.

DEFICIENCY FACTORS
0.06.08.02 ACOUSTICAL **(INCLUDING GRID) (CSI 09500)**

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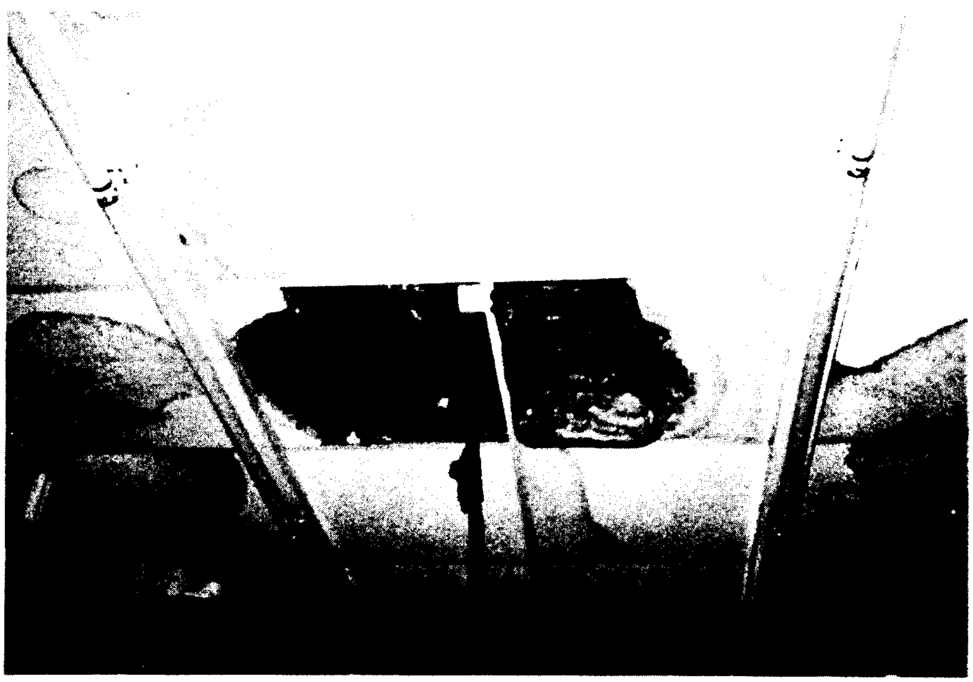

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	DAMAGED ACOUSTICAL CEILING TILE		
CEILING SYSTEMS ACOUSTICAL (INCLUDING GRID) (CSI 09510)	Revision No.	Issue Date 5/93	Drawing No. 0060802-I

DEFICIENCY FACTORS
0.06.08.02 ACOUSTICAL (INCLUDING GRID) (CSI 09500)

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DEFICIENCY FACTORS
0.06.08.02 ACOUSTICAL (INCLUDING GRID) (CSI 09500)

END OF SUBSECTION

0.06.08.03 WOOD CEILINGS (CSI 09550)

DESCRIPTION

Wood ceilings offer a wide variety of appearances while providing a surface that is durable, wear resistant, and comfortable. Wood is available in several species and can be laid in various patterns. Wood ceilings are made from both hardwood and softwood, although hardwoods predominate. Standard hardwoods include red oak, white, maple, birch, beech, pecan, mahogany, and walnut; softwoods include yellow pine, fir, western hemlock, and compressed particle board among others. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Wood Ceilings (CSI **09550)**

Types of Wood Ceilings:

There are two basic types of wood ceilings. Wood veneer ceiling is one of the most common and consists of thin strips from 3/8 to 25/32-inches thick of varying lengths with tongue-and-groove edges. Solid wood ceiling comes in the same thicknesses as wood veneer, but is over 3 1/4 inches wide.

Grades of Wood Ceilings:

Wood ceilings are graded differently than other wood products; grading rules are set by various trade associations. Unfinished oak ceiling is graded as clear, select No. 1 and 2 common. Clear is the best grade with the most uniform color. Plain sawn is standard, but quarter sawn is available on special order. Piece lengths are 1 1/4-feet and up and average 3 3/4-feet.

Beech, birch, and maple are available in first, second, and third grades along with combination grade.

Finish..

Solid wood ceilings are usually installed unfinished for field sanding, staining, and finishing. Wood may be stained and finished with wax, varnish, polyurethane, or a variety of other finishes. Wood veneer is prestained.

Installation:

Wood ceilings must be installed over a suitable nailable base. Because wood swells when damp, provisions must be made to prevent moisture from seeping in from above and to allow for expansion of the completed ceiling. Strip ceiling is installed by blind nailing through the tongue.

Two methods are used to install wood ceiling on a concrete ceiling. In the first case, a sheet of 3/4 inch plywood is attached to the-concrete to provide the nailable base. A layer of polyethylene film is laid down first if moisture may be a problem.

The wood ceiling can be supported by metal grid and suspension wire, which also provides an air space so any excess moisture can escape. In residential construction, the wood ceiling can be nailed directly to the roof structure.

OTHER RELATED COMPONENTS

Refer to Superstructure and Roofing Volumes 3 and 5, for additional deficiencies that may impact this system.

0.06.08.03 WOOD CEILINGS (CSI 09550)

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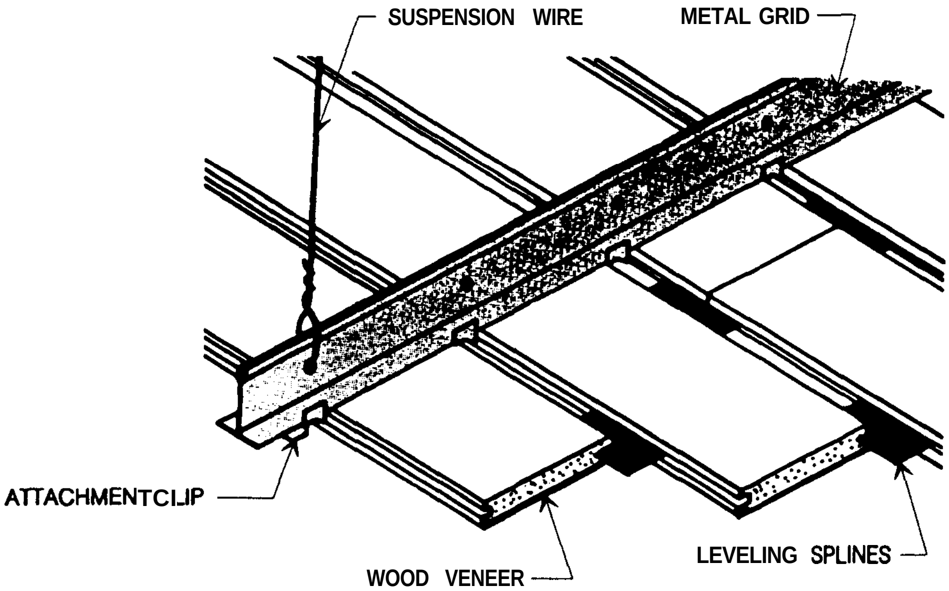
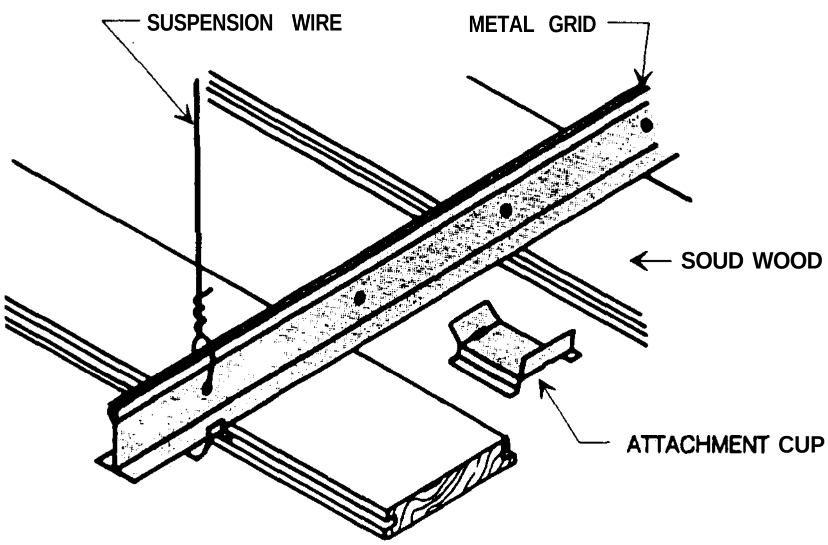


WOOD VENEER CONSTRUCTION



SOLID WOOD CONSTRUCTION

SYSTEM ASSEMBLY DETAILS **INTERIOR FINISHES & CONSTRUCTION**	**WOOD CEILINGS**		
CEILING SYSTEMS **WOOD (CSI 09545)**	Revision No.	Issue Date **5/93**	Drawing No. **A060803-1**

DEFICIENCY FACTORS
0.06.08.03 WOOD CEILINGS (CSI 09550)

PROBABLE FAILURE POINTS

- Termite and boring insect damage causing breakdown of structural integrity.
- Decay (rot) due to fungi, mildew, dry rot causing surface deterioration.
- Fire damage or charred surfaces causing flaking or surface breakdown.
- Loose connections caused by vibration, temperature changes, or improper tightness.
- Splitting or checking caused by stress, bending, or twisting.
- Cracking caused by stress, settlement/movement, poor materials, or improper construction.

SYSTEM ASSEMBLIES/DEFICIENCIES

Out-of-Alignment:	Bowing, deflection, or other movement that brings the surface out-of-plumb or not level in one or more directions.
Staining:	Surface discoloration from a foreign substance or material.
Insufficient Anchors/Connections:	Broken, damaged, loose, corroded, or missing anchorage or fasteners caused by vibration, excessive deflection, or improper tightness.
Dry Rot/Decay:	Breakdown of structural integrity from mold/mildew or dry rot.
Loss of Protective Coating/Paint:	Chalking, peeling, chipping, blistering or deterioration.
Splitting:	Surface splitting or tearing.
Insect Damage:	Holes, cracks, or punctures from burrowing insects.
Burned or Charred Surface:	Damage from fire or excessive heat on surface.
Missing Sections:	Rotting, missing, or deteriorated supports.

DEFICIENCY FACTORS
0.06.08.03 WOOD CEILINGS (CSI 09550)

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0.06.08.03 WOOD CEILINGS (CSI 09550)

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DEFICIENCY FACTORS
0.06.08.03 WOOD CEILINGS **(CSI 09550)**

END OF SUBSECTION

0.06.08.04 CONCRETE CEILING (CSI 09550)

DESCRIPTION

Concrete can be finished in a variety of ways. The simplest is to leave the concrete as it is when the forms are removed. A rough form finish shows the pattern of the formwork and joints between forms. Defects and tie holes may be left finished or unfinished. This is the roughest finish and usually used for concrete that will not be visible.

Smooth form finish is similar, but smooth forms of wood, metal, or hardboard are used, and joints and ties holes are planned so they are symmetrical. Any fins left from concrete seeping into joints between forms are removed. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Concrete Ceiling Finishes (CSI 03300)

Architectural Finishes:

These finishes are used where concrete will be exposed and appearance is a consideration. There are several varieties:

- Form Liners: the concrete is shaped with plastic, wood, or metal liners. Parallel rib liners are common. Joints and form tie holes are threaded as desired, either left exposed or patched.
- Scrubbed: the surface is wetted and scrubbed with a wire or fiber brush to remove some of the surface mortar and expose the course aggregate.
- Acid Wash: the surface is wetted with muriatic acid to expose and bring out the full color of the aggregate.
- Water Jet: a high-pressure water jet mixed with air is used to remove some of the mortar and expose the aggregate.

Tool & Sandblasted Finishes:

Tooled finishes are produced by mechanically modifying the concrete surface.

- Bush hammering: a bush-hammered finish gives a rugged, heavy texture by removing a portion of the surface made with form liners. The type of texture depends on the form liner used.
- Grinding: this finishing technique smooths out the surface of the concrete. It is similar to terrazzo in appearance.
- Applied: applied finishes include the application of other materials (e.g., plaster) to the concrete.
- Sandblasted finishes: these are produced by removing surface material from the concrete to expose the fine and course aggregate to varying degrees, depending on whether the sandblasted finish is specified as light, medium, or heavy.

Rubbed Finishes:

- Smooth: the surface of the concrete is wetted and rubbed with a corborundum brick to produce a smooth, uniform color and texture.
- Grout cleaned: grout is applied over the concrete and smoothed out. This results in a uniform surface with defects concealed.

0.06.08.04 CONCRETE CEILING (CSI 09550)

OTHER RELATED COMPONENTS

Refer to Superstructure and Roofing Volumes 3 and 5, for additional deficiencies that may impact this system.

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	ROTTED WOOD CEILING		
CEILING SYSTEMS WOOD (CSI 09545)	Revision No.	Issue Date 5/93	Drawing No. D060803-1

DEFICIENCY FACTORS
0.06.08.04 CONCRETE CEILING (CSI 03300)

PROBABLE FAILURE POINTS

- Lack of curing will increase the degree of cracking within a concrete structure.
- Reinforcement corrosion is an electro-chemical process that occurs in the presence of air and moisture.
- A number of deleterious chemical reactions may result in concrete cracks. These reactions may be due to the aggregate used to make the concrete or materials that come into contact with after it has hardened or cured.
- A wide variety of poor construction practices can result in cracking in concrete or masonry structures, especially adding water to concrete to improve workability. Added water has the effect of reducing strength, increasing deformation, and increasing ultimate drying shrinkage.
- Construction overloads induced during construction can be far more severe than those experienced in the lifetime of the structure. Unfortunately, these conditions may occur at early ages when the concrete is most susceptible to damage and often result in cracks.
- Externally applied loads are known to induce tensile stresses which result in concrete cracks. Current ACI 318 design procedures use reinforcing steel, not only to carry the tensile forces, but to obtain both an adequate crack distribution and reasonable limit on crack width.

SYSTEM ASSEMBLIES/DEFICIENCIES

Poor Surface Preparation:	Dirt, grease, moisture, mill scale rust, concrete dust, or other foreign material.
Spalling:	Concrete fragments broken from the surface, caused by the reinforcement corrosion.
Settlement:	Solid particles sink in fresh concrete, after placement and before initial set.
Exposed Reinforcing:	Insufficient steel cover. Concrete quality. Calcium chloride overused as admixture.
Alkali-Aggregate Expansion:	Chemical reaction between aggregate and cement paste causing separation and bond break-up.
Cracking (Active and Dormant):	Construction movement, settlement, shrinkage around reinforcement. Settling due to inadequate finishing and curing. Chemical reactions such as corrosion. Physical reactions such as drying shrinkage. Thermal changes (subjected to temperature extremes such as from freeze/thaw cycles). Stress concentration. Structural design. Accidents from overload, vibration, fatigue, and earthquake.
Crazing:	Surface shrinkage more rapid than interior of concrete mass. Too high a slump. Too rich a mix. Poor timing on finishing. Too rapid absorption of moisture.
Holes (Small and Large):	Chemical reaction. Inadequate construction and design.

DEFICIENCY FACTORS
0.06.08.04 CONCRETE CEILING (CSI 03300)

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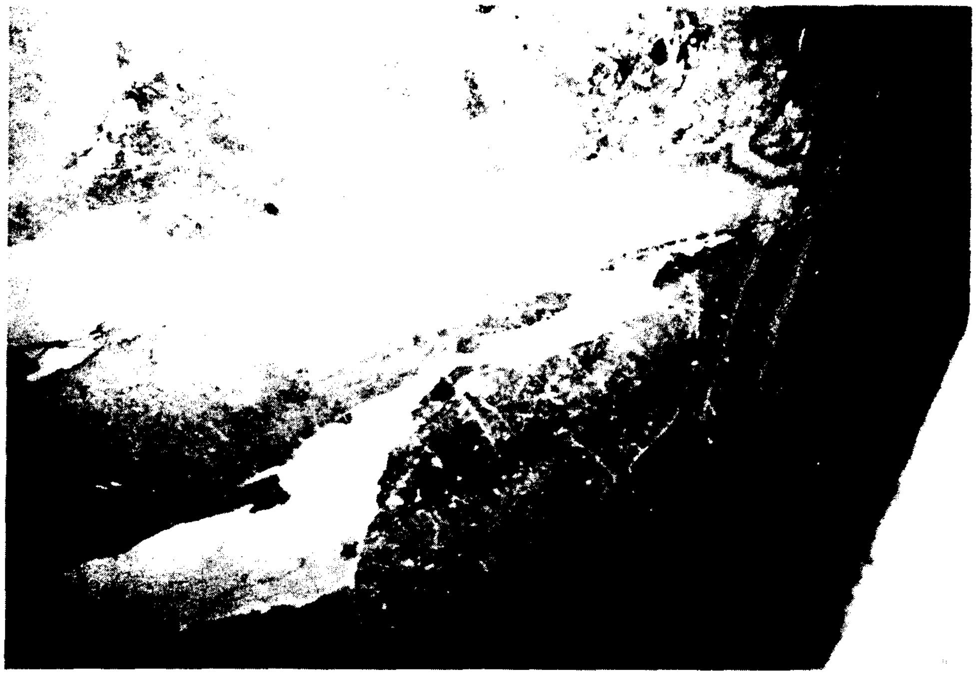

PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES 8 CONSTRUCTION	DAMAGED CONCRETE CEILING		
CEILING SYSTEMS CONCRETE (CSI 03300)	Revision No.	Issue Date 5/93	Drawing No. 0060804-I

DEFICIENCY FACTORS
0.06.08.04 CONCRETE CEILING (CSI 03300)

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DEFICIENCY FACTORS
0.06.08.04 CONCRETE CEILING **(CSI 03300)**

END OF SUBSECTION

0.06.08.05 METAL CEILINGS (CSI 09510)

DESCRIPTION

Metal ceilings are relatively lightweight and most are installed by ceiling contractors. The pre-manufactured metal ceiling panels consist of light gauge (24- or 26-gauge) metal panels set on T-bars and stainless-steel wall moldings. The most common materials are galvanized steel and aluminum. Graphic assembly details that follow illustrate general assembly/component types only and are not meant as a definitive, exhaustive, in-depth system breakdown. Field conditions will vary and are subject to project type, local requirements, and facility design.

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

Metal Ceilings (CSI 09510)

Steel and aluminum ceiling panels are snap-in-types, removable from any point in the ceiling. A continuous finish bead surrounds all four sides of panels. Steel ceilings are die-formed from 24-gauge, cold-rolled (electro-galvanized) steel. Aluminum ceilings are die-formed using 20 and 22-gauge aluminum sheets. The sizes of the panels for both steel and aluminum are as follows: 12 x 12-inches, 12 x 24-inches, 12 x 36-inches, 12 x 48-inches, and 24 x 24-inches beveled on all four edges and cross-scored units. The finish is normally two coats of baked white polyester paint applied to the face of the panels and one coat applied to the back of the panels.

- Steel tees are the supporting system for steel panels; T-bars are also made of galvanized steel and finished to match the ceiling panels. Aluminum T-bars ares used aluminum panels,
- Wall moldings match the finish of the metal panels.
- All attachments and metal accessories are made of galvanized steel or aluminum to provide a completely integrated system.
- Sound-absorbing pads are PVC wrapped glass fiber (mineral wool) material 1", 1 1/2", or 1 1/4" thick and are laid so that they completely fill the panels.

Metal panels offer the following advantages for acoustical ceiling tile:

- Long life - ceilings are as permanent as the building itself.
- Resistance to damage - metal has the ability to withstand more impact than other materials.
- Sound transmission control - use sound attenuation panels in conjunction with acoustical ceiling panels.
- Incombustibility - use various types of steel and aluminum in conjunction with PVCwrapped glass fiber or mineral wool acoustical pads.

OTHER RELATED COMPONENTS

Refer to Superstructure and Roofing Volumes 3 and 5 for additional deficiencies that may impact this system.

0.06.08.05 METAL CEILINGS **(CSI 09510)**

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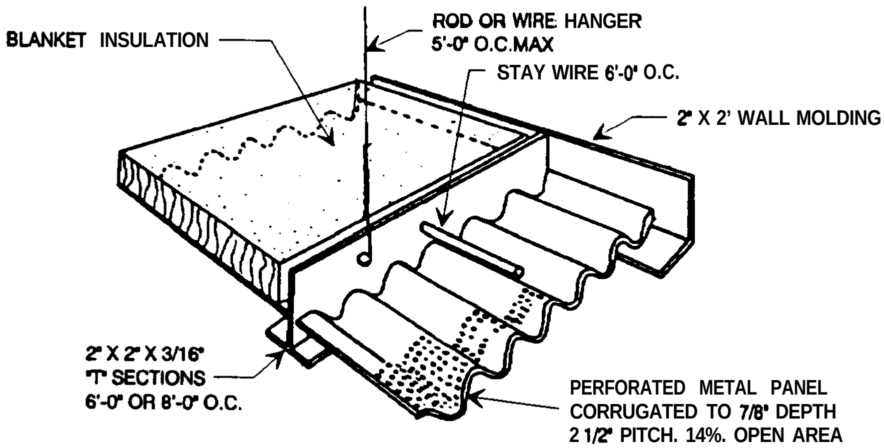
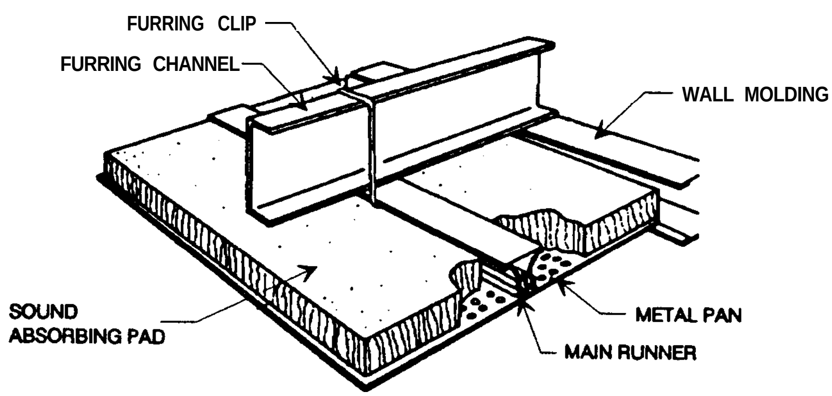
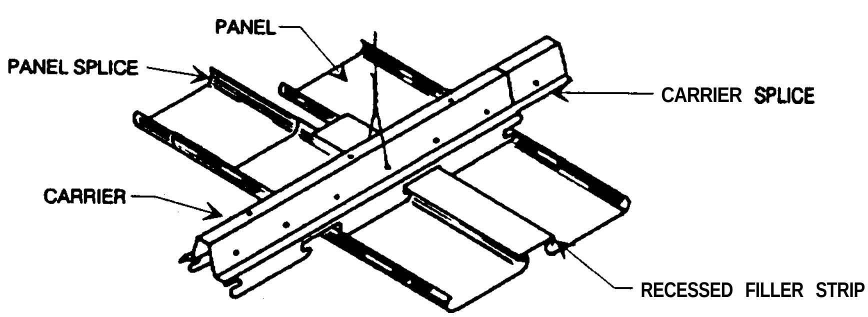


PERFORATED METAL CEILING



METAL CEILING PAN



LINEAR METAL CEILING

SOURCE: ARCHITECTURAL GRAPHIC STANDARDS, EIGHTH EDITION

SYSTEM ASSEMBLY DETAILS INTERIOR FINISHES & CONSTRUCTION	METAL CEILINGS		
CEILING SYSTEMS METAL (CSI 09510,09545)	Revision No.	Issue Date 5/93	Drawing No. A060805-1

DEFICIENCY FACTORS
0.06.08.05 METAL CEILINGS (CSI 09510)

PROBABLE FAILURE POINTS

- Metal corrosion electro-chemical process that occurs in the presence of air and moisture.
- Poor materials, improper construction.
- Loose connections caused by vibration, temperature changes, improper tightness.

SYSTEM ASSEMBLIES/DEFICIENCIES

Corrosion:	A chemical or electro-chemical reaction that converts the metal into an oxide, carbonate, and sulfides.
Out-of-Alignment:	Bowing, deflection, or other movement that brings the surface out-of-plumb or not level in one or more directions.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Loss of Protective Coating/Paint:	Chalking, peeling, chipping, blistering, or deterioration.
Loose Connections:	Impact, vibration, fatigue loading, or incorrect tightness.
Missing Sections:	Corrosion of supporting accessories.

DEFICIENCY FACTORS
0.08.08.05 METAL CEILINGS (CSI 09510)

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PHOTO ILLUSTRATION

SYSTEM ASSEMBLY DEFICIENCY DETAILS INTERIOR FINISHES & CONSTRUCTION	RUSTED CORRUGATED METAL CEILING		
CEILING SYSTEMS METAL (CSI 05300)	Revision No.	Issue Date 5/93	Drawing No. D060805-1

DEFICIENCY FACTORS
0.06.08.05 METAL CEILINGS (**CSI** 09510)

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DEFICIENCY FACTORS
0.06.08.05 METAL CEILINGS (CSI 09510)

END OF SUBSECTION

INSPECTION METHODS . STANDARD

GUIDE SHEETS

The following Guide Sheets provide a general overview of inspection methods and requirements used to provide a general interior finishes and construction inspection. Sheets have been developed for each major type and associated assembly components as follows:

TABLE ONE

Assembly/Component	Control Number
STANDARD	
PARTITIONS CONVENTIONAL..	GSS 0.06.01
PARTITIONS SPECIALTY..	GSS 0.06.02
TOILET PARTITIONS & ACCESSORIES..	GSS 0.06.03
INTERIOR DOORS..	GSS 0.06.04
PAINT FINISHES/COATINGS	GSS 0.06.05
WALL COVERING SYSTEMS..	GSS 0.06.06
FLOOR FINISHING SYSTEMS..	GSS 0.06.07
CEILING SYSTEMS..	GSS 0.06.08

INSPECTION METHODS - STANDARD

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INSPECTION METHODS . STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PARTITIONS CONVENTIONAL
CONTROL NUMBER: GSS 0.06.01

APPLICATION

This guide applies to all interior conventional partitions consisting of cast-in-place concrete, precast concrete, concrete masonry units, brick, stone, structural tile, and drywall/plaster.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect Doors. (See GSS 0.06.04)
2. Inspect Paint Finishes/Coatings. (See GSS 0.06.05)
3. Inspect Wall Covering Systems. (See GSS 0.06.06)
4. Inspect Floor Finish Systems. (See GSS 0.06.07)
5. Inspect Ceiling Systems. (See GSS 0.06.08)
6. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to interior conventional partition deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Interior Conventional Partitions to include visual survey, examination of building records, and analysis. Points include:

1. Check general appearance for any stress-related conditions. Determine type of stress as tension (pulling force), which causes crushing and usually no spalling; compression (pushing or crushing force), which causes crushing or spalling; shear (slicing action), which causes diagonal or stepped cracking from point of maximum load or shear; and bending (combination of tension and compression), which causes cracking with no spalling.
2. Check for uplift or presence of hydrostatic pressure causing upward movement of existing grade, slab, or wall.
3. Check for exposure conditions, specifically chemical attack (i.e., is surface material resistant to process contamination), impact exposure, staining and rust, dusting, surface deterioration, pitting, spalling, operation or misuse of material, and extent of each.
4. Check all previous repairs and patches for possible cracking or deterioration.
5. Check for any exposed reinforcement and extent for rust or deterioration in masonrv or concrete partitions.
6. Check all sealant, expansion/contraction joints for cracking or deformation, and mortar/grout joints for deterioration, cracking, or missing sections.
7. Check for dampness and/or stains. Note location and determine type of stain and cause.
8. Check for any microorganism growth such as molds, fungii, mildew, or rot.
9. Check the surface finish for any damage or deterioration.
10. Check for damage at surface bondto substrate or anchorage to supports. Check for sagging, loose spots, or pulling away. Check any fasteners for damaged, deteriorated, loose, or missing conditions.

INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PARTITIONS CONVENTIONAL (Continued)
CONTROL NUMBER: GSS 0.06.01

INSPECTION ACTIONS

11. Perform stress analysis and monitor cracking to determine if cracks are active or dormant. Stress analysis consists of documenting the location, pattern, depth and width, presence of foreign materials, and elevation differences between two cracked surfaces. Determine if crack is active or dormant by following the steps.
    a. Mark the end of the crack and check to see if it has extended past mark. Note direction.
    b. Place a notched piece of tape across the crack. Wait for a period of a month or more. If tape tears or compresses (wrinkles) the crack is active, and if the tape shows no apparent change the crack is dormant.
    c. Apply pins and gauge points on either side of crack. Measure distance between points at regular intervals with vernier calipers to determine the extent of movement.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PARTITIONS SPECIALTY
CONTROL NUMBER: GSS 0.06.02

APPLICATION

This guide applies to all interior specialty partitions consisting of demountable, folding leaf, accordian type partitions, and accessories.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect Doors. (See GSS 0.06.04)
2. Inspect Paint Finishes/Coatings. (See GSS 0.06.05)
3. Inspect Wall Covering Systems. (See GSS 0.06.06)
4. Inspect Floor Finish Systems. (See GSS 0.06.07)
5. Inspect Ceiling Systems. (See GSS 0.06.08)
6. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to interior specialty partition deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Interior Specialty Partitions to include visual survey, examination of building records, and analysis. Points include:

1. Check for uplift or presence of hydrostatic pressure causing upward movement of existing grade, slab, or wall.
2. Check for exposure conditions, specifically chemical attack, (i.e., is surface material resistant to process contamination), impact exposure, staining and rust, surface deterioration, pitting, operation or misuse of material, and extent of each.
3. Check all previous repairs and patches for possible cracking or deterioration.
4. Check all sealant, expansion/contraction joints for cracking, deformation, and deterioration.
5. Check for stains. Note location and determine type of stain and cause.
6. Check condition and operation of all tracks, hardware, and controls.
7. Check condition of any anchorage for damage or deterioration.
8. Check operation of movable partitions for any deficiencies. Judge against manufacturer's specifications.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS - STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: TOILET PARTITIONS & ACCESSORIES
CONTROL NUMBER: GSS 0.06.03

APPLICATION

This guide applies to all partitions and toilet accessories, including the fixture, angle stops, faucets, handles, toilet partitions, water closet seats, all flushometers, tissue paper holders, paper towel dispensers, soap dispensers, shower stalls, shower pans, and bath tubs.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Coordinate with Mechanical Inspection 0.08.01 of plumbing system. (See Volume 0.08 Mechanical Systems.)
2. Inspect accessories as noted below.
3. Inspect general finishes as outlined in Volume 6.

INSPECTION ACTIONS

Condition Assessment Survey of Toilet Partition and Accessories to include visual survey, examination of building records, and analysis. Points include:

1. Inspect lavatories for chips and cracks.
2. Check that all faucets are functioning properly without leaks. Check strainers for foreign objects.
3. Check stopper in sink outlet and exercise.
4. Check all angle valves and exercise them to ensure that they are functional.
5. Check remaining porcelain fixtures for chips and cracks, such as urinals and water closets.
6. Exercise all flushometers to ensure that they are working without leaks.
7. Operate all shower valves and ensure that the heads are in good working order. Ensure that all openings in the shower heads are open.
8. Check all toilet partitions for missing anchoring bolts and ensure that they are not loose.
9. Check all toilet and shower partitions for cleanliness and to determine if resurfacing or painting is required.
10. Check ceramic tile walls and floors to see if special cleaning is required, tiles need resurfacing, or regrouting is required.
11. Check shower drain and pan to see if it is in place or requires repair.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS . STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: INTERIOR DOORS
CONTROL NUMBER: GSS 0.06.04

APPLICATION

This guide applies to all interior doors, hardware, and associated work.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to references and glossaries as needed.

CONCURRENT ACTIONS

1. Inspect Partitions Conventional. (See GSS 0.06.01)
2. Inspect Partitions Specialty. (See GSS 0.06.02)
3. Inspect Paint Finishes/Coatings. (See GSS 0.06.05)

INSPECTION ACTIONS

Condition Assessment Survey of Interior Doors to include visual survey, examination of building records, and analysis. Points include:

1. Check for exposure conditions, specifically chemical attack (i.e., is surface material resistant to process contamination), impact exposure, staining and rust, surface deterioration, decay, splitting, operation or misuse of material, and extent of each.
2. Check all previous repairs and patches for possible damage or deterioration.
3. Check for loose or missing fasteners or anchorage.
4. Check condition of wood frames for indications of wood rot, cracked/broken section, warping, and finish failure.
5. Check condition of metal frames and surfaces for indications of excessive corrosion, pitting, scaling, checking, warping, and finish loss.
6. Check condition of gaskets and/or putty for deformation and deterioration, including any cracking or missing areas that would allow glazing slippage.
7. Check for cracked, broken, or missing glazing units if applicable.
8. Check stains. Note locations and determine type of stain and cause.
9. Check for any microorganism growth such as bacteria, molds, fungii, mildew, or dryrot on wood surfaces.
10. Check for any insect damage; i.e., termites or carpenter ants on wood surfaces.
11. Check operation and condition of hardware for damage, inoperative condition, finish deterioration, or missing components.
12. Check all door mechanisms, including door closures counterbalances, tracks, motors, gear boxes, hold opens, etc. for proper operation, alignments, or balancing.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS - STANDARD

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INSPECTION METHODS . STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PAINT FINISHES/COATING
CONTROL NUMBER: GSS 0.06.05

APPLICATION

This guide applies to all painting systems.

SPECIAL INSTRUCTIONS

1. Review manufacturer's or installer's instructions.
2. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
3. Refer to glossary and references as needed.

CONCURRENT ACTIONS

Inspect substrate of painting systems for any other signs of damage or deterioration that may be related to painting system deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Painting Finishes/Coating Systems to include visual survey, examination of building records, and analysis. Points include:

1. Check for exposure conditions, specifically chemical attack (i.e., is surface resistant to process contamination), impact exposure, staining and rust, abrasion, marks, and extent of each.
2. Check for finish or coating failures such as chalking and/or checking.
3. Check for adhesion-related failures such as blistering, flaking, and peeling. This is the most common deficiency.
4. Check for surface or substrate compatibility with paint finish or coating.
5. Check for improper surface preparation or application such as improper thickness, pinholes, overspray, holidays, surface contamination, or improper drying.
6. Check substrate design for failure points such as crevices or sharp edges.
7. Check for dampness and/or stains. Note location and determine type of stain and cause.
8. Check for any microorganism growth such as bacteria , fungii, or mildew.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS ▪ STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: WALL COVERING SYSTEMS
CONTROL NUMBER: GSS 0.06.06

APPLICATION

This guide applies to all interior wall covering systems and associated work.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect Walls. (See GSS 0.04.01)
2. Inspect Partitions Conventional. (See GSS 0.06.01)
3. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to wall covering systems deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Wall Covering Systems to include visual survey, examination of building records, and analysis. Points include:

1. Check for exposure conditions, specifically chemical attack (i.e., is surface material resistant to process contamination), impact exposure, staining, surface deterioration, operation or misuse of material, and extent of each.
2. Check all previous repairs and patches for possible failures or deterioration.
3. Check for loose, damaged, or missing fasteners.
4. Check for warped, split, curled, rotted, decayed, or deteriorated wood surfaces.
5. Check for degradation, cracking, brittleness.
6. Check all seams for separation, deterioration, and looseness.
7. Check condition of sealants including cracking, deformation, and deterioration.
8. Check for dampness and/or stains. Note location and determine type of stain and cause.
9. Check condition of any paint or coatings for damage or deterioration such as cracks, peeling, etc.
10. Check for any plant or microorganism growth such as bacteria, molds, or fungii.
11. Check insect damage; i.e., termites or carpenter ants.
12. Check condition of anchorage to verify that it is intact and properly tightened.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS . STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: FLOOR FINISHING SYSTEMS
CONTROL NUMBER: GSS 0.06.07

APPLICATION

This guide applies to all floor finishing systems and associated work.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to references and glossaries as needed.

CONCURRENT ACTIONS

1. Inspect Floors. (See GSS 0.03.03)
2. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to floor finishing systems deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Floor Finishing Systems to include visual survey, examination of building records, and analysis. Points include:

1. Check for uneven settlement by observing condition of existing slab or subfloor.
2. Check for any structural defect that may cause upward movement existing slab or subflooring, which can cause various floor finish defects.
3. Check for exposure conditions, specifically chemical attack (i.e., is surface material resistant to process contamination), impact exposure, staining, dusting, surface deterioration, decay, splitting, operation or misuse of material, and extent of each.
4. Check for water or moisture damage causing material deterioration and breakdown.
5. Check all previous repairs and patches for possible cracking or deterioration.
6. Check for any plant or microorganism growth such as moss, bacteria, molds, or fungii.
7. Check for any insect damage; i.e., termites or carpenter ants.
8. Check for damage at surface bond to substrate. Check for sagging, loose spots, or pulling away.
9. Check for edge curling, tears, uneven appearance, and water spotting.
10. Check for tile brittleness, grout deterioration, and broken tiles.
11. Check for unevenness at joints, warped or buckled floors, and squeaks.
12. Check carpet for worn spots, holes, tears, frayed edges, rough seams, and damaged seams.

TOOLS & MATERIALS

Standard Tools - Basic

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: CEILING SYSTEMS
CONTROL NUMBER: GSS 0.06.08

APPLICATION

This guide applies to all ceilings including drywall/plaster, acoustical, metal, concrete, and wood.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review any as-builts and other data to determine locations, types, and construction.
3. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect superstructure for any other signs of damage or deterioration that may be related to ceiling deficiencies.
2. Coordinate with electrical inspection of light fixtures. (See volume 9, Electrical Systems.)

INSPECTION ACTIONS

Condition Assessment Survey of Ceilings to include visual survey, examination of building records, and analysis. Points include:

1. For concrete ceilings, check for cracked, spalling and exposed, corroded reinforcing. If water is present, determine source. (See GSNS 0.06.08 for further details.)
2. For drywall/plaster ceilings, inspect for cracked or missing sections, bowing, and/or evidence of water damage.
3. For acoustical ceilings, check both tile and grid suspension system. Note any broken or missing tiles, loose support grids, and/or any evidence of water damage.
4. Check metal ceiling systems for signs of corrosion (due to water leaks or area environmental conditions), bowed or dented sections, and any missing pieces.
5. For wood ceilings, inspect for damage due to water leaks, bowed areas, or missing sections.

TOOLS & MATERIALS

Standard Tools - Basic

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INSPECTION METHODS . NON-STANDARD

GUIDE SHEETS

The following Guide Sheets outline an overview of inspection methods and requirements used in providing a general non-standard interior finishes and construction inspection. For these non-standard inspections, it is assumed that all standard inspections will be completed to determine non-standard methodology. (However, non-standard methods may be implemented as a non-contingent option.) Non-Standard Guide Sheets have been developed for each major assembly type and associated assembly components as follows:

TABLE TWO

Assembly/Component	Control Number
NON-STANDARD	
PARTITIONS CONVENTIONAL..	**GSNS 0.06.01**
PARTITIONS SPECIAL-T-Y..	**GSNS 0.06.02**
TOILET PARTITIONS & ACCESSORIES..	**GSNS 0.06.03**
INTERIOR DOORS..	**GSNS 0.06.04**
PAINT FINISHES/COATINGS	**GSNS 0.06.05**
WALL COVERING SYSTEMS..	**GSNS 0.06.06**
FLOOR FINISHING SYSTEMS..	**GSNS 0.06.07**
CEILING SYSTEMS..	**GSNS 0.06.08**

INSPECTION METHODS • NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PARTITIONS CONVENTIONAL
CONTROL NUMBER: GSNS 0.06.01

APPLICATION

This guide applies to all non-standard inspection procedures for interior conventional partitions consisting of cast-in-place concrete, precast concrete, concrete masonry units, brick, stone, structural tile, and drywall/plaster.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect Doors. (See GSNS 0.06.04)
2. Inspect Paint Finishes/Coatings. (See GSNS 0.06.05)
3. Inspect Wall Covering Systems. (See GSNS 0.06.06)
4. Inspect Floor Finish Systems. (See GSNS 0.06.07)
5. Inspect Ceiling Systems. (See GSNS 0.06.08)
6. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to exterior wall deficiencies.
7. Complete inspection requirements listed in GSS 0.06.01.

INSPECTION ACTIONS

Based on results of GSS 0.06.01 and/or as directed, proceed to non-standard inspections. Points include:

1. Perform an environmental data analysis to determine the effects of external environmental conditions.
2. Inspect partition with a fluoroscope or borescope to locate cracks, surface deterioration, or internal integrity.
3. Perform Surface Hardness Testing or Maturity Concept Analysis to determine material condition and locate possible defects or deficiencies.
4. Take core samples to determine condition or strength of the material. Patch sample holes immediately. Use great care when performing this work and consult a licensed structural engineer before proceeding. Usually not performed on drywall/plaster partitions..
5. Perform Infrared or Nuclear Analysis Testing to determine if water or moisture is present, indicating general location of cracks, breaks, or heat loss.
6. Perform Ultrasonic Pulse Velocity Test to locate defects within the material to determine degree of deterioration and material thickness.
7. Perform Magnetic Test to determine material thickness, and reinforcement location.
8. Perform Electrical Resistivity Test to determine moisture content, material thickness, and degree of corrosion or deterioration.
9. Perform Radiography (X-Ray) Testing to detect cracking, internal defects, and deficiencies.
10. Perform Microwave Absorption Scanning to determine moisture content and material defects. This is a relatively new method still under development.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

INSPECTION METHODS - NON-STANDARD

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INSPECTION METHODS . NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PARTITIONS SPECIALTY
CONTROL NUMBER: GSNS 0.06.02

APPLICATION

This guide applies to all non-standard inspection procedures for interior specialty partitions consisting of demountable, folding leaf, accordian type partitions, and accessories.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect Doors. (See GSS 0.06.04)
2. Inspect Paint Finishes/Coatings. (See GSNS 0.06.05)
3. Inspect Wall Covering Systems. (See GSNS 0.06.06)
4. Inspect Floor Finish Systems. (See GSNS 0.06.07)
5. Inspect Ceiling Systems. (See GSNS 0.06.08)
6. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to exterior wall deficiencies.
7. Complete inspection requirements listed in GSS 0.06.02.

INSPECTION ACTIONS

Based on results of GSS 0.06.02 and/or as directed, proceed to non-standard inspections. Points include:

1. Perform an environmental data analysis to determine the effects of external environmental conditions.
2. Inspect partition with a fluoroscope or borescope to locate cracks, surface deterioration, or internal integrity.
3. Perform Ultrasonic Pulse Velocity Test to locate defects within the material to determine degree of deterioration and material thickness.
4. Perform Magnetic Test to determine material thickness, and reinforcement location.
5. Perform Electrical Resistivity Test to determine moisture content, material thickness, and degree of corrosion or deterioration.
6. Perform Radiography (X-Ray) Testing to detect cracking, internal defects, and deficiencies.
7. Perform Microwave Absorption Scanning to determine moisture content and material defects. This is a relatively new method still under development.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

INSPECTION METHODS - NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: TOILET PARTITIONS & ACCESSORIES
CONTROL NUMBER: GSNS 0.06.03

APPLICATION

This guide applies to all non-standard inspection procedures for toilet partitions and accessories, including handles, toilet partitions, tissue paper holders, paper towel dispensers, soap dispensers.

SPECIAL INSTRUCTIONS

Complete standard inspection in accordance with Guide Sheet GSS 0.06.03.

CONCURRENT ACTIONS

In accordance with standard inspection for 0.08.01 Plumbing, proceed to non-standard inspections as required.

INSPECTION ACTIONS

Based on results of GSS 0.06.03 and/or as directed, proceed to non-standard inspections. Points include:

- No non-standard inspection actions are required for toilet partitions and accessories. However, non-standard inspection actions involving Plumbing outlined in Section 0.08.01 may be required and should be coordinated closely with the inspection methods detailed in Volume 0.08 Mechanical Systems.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

INSPECTION METHODS . **NON-STANDARD**

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INSPECTION METHODS . NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: INTERIOR DOORS
CONTROL NUMBER: GSNS 0.06.04

APPLICATION

This guide applies to all non-standard inspection procedures for interior doors, hardware, and associated work.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect Partitions Conventional. (See GSNS 0.06.01)
2. Inspect Partitions Specialty. (See GSNS 0.06.02)
3. Inspect Paint Finishes/Coatings. (See GSNS 0.06.05)
4. Complete inspection requirements listed in GSS 0.06.04.

INSPECTION ACTIONS

Based on results of GSS 0.06.04 and/or as directed, proceed to non-standard inspections. Points include:

1. Perform an environmental data analysis to determine the effects of external environmental conditions.
2. Perform Infrared or Nuclear Analysis Testing to determine if water or moisture is present, indicating general location of cracks, breaks, or holes.
3. Perform Ultrasonic Pulse Velocity Test to locate defects within the material to determine degree of deterioration and material thickness.
4. Perform Magnetic Test to determine material thickness, and material cracks.
5. Perform Electrical Resistivity Test to determine material thickness, and degree of corrosion or deterioration.
6. Perform Radiography (X-Ray) Testing to detect cracking, and material defects or deficiencies.
7. Perform Microwave Absorption Scanning to determine material defects. This is a relatively new method still under development.
8. Perform a Pick Test to determine degree of deterioration, decay, or rot for wood doors and frames.
9. Inspect complete operation of door type observed; lubricate and/or make required adjustments, including calibrations.
10. Perform any non-standard mechanical or electrical inspections required for type of door observed or method of operation. Refer to Volumes 8 and 9 as necessary.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

INSPECTION METHODS • NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: PAINT FINISHES/COATINGS
CONTROL NUMBER: GSNS 0.06.05

APPLICATION

This guide applies to all non-standard inspection procedures for painting systems.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to references and glossaries as needed.

CONCURRENT ACTIONS

1. Inspect substrate of painting systems for any other signs of damage or deterioration that may be related to painting system deficiencies.
2. Complete inspection requirements listed in GSS 0.06.05.

INSPECTION ACTIONS

Based on results of GSS 0.06.05 and/or as directed, proceed to non-standard inspections. Points include:

1. Perform an environmental data analysis to determine the effects of external environmental conditions.
2. Perform field adhesion testing using tensile testing instrument or a tape adhesion test as described in ASTM D-3359, “Measuring Adhesion by Tape Test.”
3. Perform a low-Voltage or high-Voltage wet sponge detector test to locate holidays, pinholes, nicks, and scrapes.
4. Perform Magnetic Test to determine surface/coating thickness with magnetic flux gauges.
5. Perform Electrical Resistivity Test by using Eddy current testing instruments to determine surface/coating thickness.
6. Perform Magnetic Pull-Off Test to determine surface/coating thickness.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

INSPECTION METHODS - NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: WALL COVERING SYSTEMS
CONTROL NUMBER: GSNS 0.06.06

APPLICATION

This guide applies to all non-standard inspection procedures for wall covering systems including coverings, paneling, and tile.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect partitions Conventional. (See GSNS 0.06.01)
2. Inspect Partitions Specialty. (See GSNS 0.06.02)
3. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to wall covering systems deficiencies.
4. Complete inspection requirements listed in GSS 0.06.06.

INSPECTION ACTIONS

Based on results of GSS 0.06.06 and/or as directed, proceed to non-standard inspections. Points include:

- No non-standard inspection actions are required for wall covering systems. Normally, any significant deficiencies found require replacement, as there are no inexpensive testing methods for this system.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: FLOOR FINISHING SYSTEMS
CONTROL NUMBER: GSNS 0.06.07

APPLICATION

This guide applies to all non-standard inspection procedures for floor finishing systems consisting of carpet, composition/resilient flooring, terrazzo, tile, wood flooring, and associated work.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to references and glossaries as needed.

CONCURRENT ACTIONS

1. Inspect Floors. (See GSS 0.03.03)
2. Inspect substructure and superstructure for any other signs of damage or deterioration that may be related to floor finishing systems deficiencies.

INSPECTION ACTIONS

Based on results of GSS 0.06.07 and/or as directed, proceed to non-standard inspections. Points include:

1. Have a trained specialist test for VAT in older buildings.
2. No field test exists for carpeting; it must be performed in a lab, with a 6 X 6-foot carpet sample. The carpet is tested for fading, worn surface, ply thickness, and backing condition.
3. Wood: Perform a pick test to determine the degree of deterioration, decay, or rot.
4. Perform radiography (X-Ray) testing to detect cracking, material defects, or other deficiencies.
5. Terrazzo: Perform surface hardness testing or maturity concept analysis to determine material condition and locate possible defects or deficiencies.
6. Terrazzo/Ceramic Tile: Perform infrared or nuclear analysis testing to determine if water or moisture is present, indicating general location of cracks or breaks.
7. Terazzo: Take core samples to determine condition or strength of the material. Patch as soon as possible.

TOOLS & MATERIALS

Standard Tools - Basic

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: CEILING SYSTEMS
CONTROL NUMBER: GSNS 0.06.08

APPLICATION

This guide applies to all non-standard inspection procedures for ceilings including drywall/plaster, acoustical, metal, concrete, and wood.

SPECIAL INSTRUCTIONS

1. Review any as-builts and other data to determine locations, types, and construction.
2. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect superstructure for any other signs of damage or deterioration that may be related to ceiling deficiencies.
2. Complete inspection requirements listed in GSS 0.06.08.

INSPECTION ACTIONS

Based on results of GSS 0.06.08 and/or as directed, proceed to non-standard inspections. Points include:

1. Most ceiling damage can be traced to water penetration or leaks which can be traced to a number of sources (roof, plumbing, steam line, etc.). If sources cannot be traced, use of non-standard inspection test methods. Prior to commencing these tests, all ancillary inspections(roof, superstructure, and mechanical) should be reviewed for concrete ceilings. Review tests outlined in Volume 3 Superstructures for applicability: water leakage may have damaged reinforcing steel.
2. If ceiling system is located in an area exposed to varied environmental conditions, an environmental test should be conducted to determine if elements of this environment may be damaging ceiling systems.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. As required for the type of test being performed.

INSPECTION METHODS - NON-STANDARD

END OF SUBSECTION

DATA COLLECTION METHODS

GENERAL

The heart of the CAS System is built around the hand-held data collection device and the CAIS software that supports it. As discussed in the Introduction, this is a "new way" of seeing and recording specific standardized information. Several phases are involved in the CAS inspection process. They include:

PHASE I — PRESURVEY

- Facility managers review assets and assign each an Asset Determinant Factor (ADF) to define the level and type of inspection to be accomplished (see Subsection 1 .1 for definition).
- Facility managers assign specific assets to CAS inspectors.
- The CAS Inspector reviews existing asset data (including as-builts and past repair reports) and the Work Breakdown Structure (WBS) systems requiring inspection, which are then subdivided as necessary. (For example, a large roof may be subdivided into four (4) WBS items such as North, South, East and West sections.)
- The inspector establishes the Inspection Units (IU) to be surveyed based on the WBS (or multiple WBS). IUs may also be added in the field.
- Facility manager and/or staff downloads asset data into the hand-held data collection device.

PHASE 2 — SURVEY

- Conduct CAS inspection.
- Upload data into PC-based CAIS.
- Review raw data "universal" reports.

PHASE 3 — **POSTSURVEY**

- Correct data, as necessary, issue final "universal" report, and create other required reports for facility managers.
- Data and reports are created and issued through DOE hierarchy (see Introduction).

DATA COLLECTION METHODS

ENTERING DATA: DATA COLLECTION MENU

SURVEY STEP: **LOGIN** SCREEN 1.0

The screen contains identification data including the inspector's name, ID number, and discipline to be inspected. This data may be input or preloaded. From this screen, several information and help pop-up aids can be accessed. Help functions would provide screen-specific instructions, and information functions would list special management instructions and/or schedules specifically for the inspector.

SURVEY STEP: ASSET IDENTIFICATION SCREEN 2.0

Asset identification including class, type, ADF number (see subsection 1.1 for ADF description), and asset ID numbers are captured on this screen. Pop-up screens with preformatted picklists (for type and class) are provided for the inspector's review and selection. Additional support screens include ASSET DIMENSIONS indicating key elements required for inspection (such as asset gross square footage, perimeter, height, etc.); and ASSET DESCRIPTION for recording asset name and address. Such information would be entered (or verified) by the inspector prior to the actual asset CAS inspection.

SURVEY STEP: **WBS** SELECTION SCREEN 3.0

This screen displays the preselected systems and WBS listings based on the ADF selected for the particular asset. Although all WBS assemblies for a system will be listed, the inspector selects only assemblies applicable to the specific asset. For example, although all system 0.05 Roof WBS categories are listed, the inspector would eliminate all non-applicable categories by "de-selecting" non-applicable items. Once this process is complete, the inspector can re-sort the included WBS items. Columns are also provided that indicate the survey status for each WBS item.

At this point, the inspector can subdivide the WBS. For example, the inspector may elect to split a large roof into four sections, each as a separate WBS, or isolate a pump from a WBS containing several pumps. This feature will allow the inspector to logically build his survey based on the unique properties and requirements of each asset.

Finally, while most WBS structuring will be accomplished prior to the CAS inspection, WBS subdivision can also be done in the field.

DATA COLLECTION METHODS

ENTERING DATA: DATA COLLECTION MENU (Continued)

SURVEY STEP: INSPECTION UNIT (NJ) SELECTION SCREEN 4.0

While screen 3.0 defines the WBS structure, screen 4.0 concerns selecting the IU for each WBS category. In the CAIS software, the base CAS (see subsection 1.1 for definition) is preset at the assembly level for all systems. For example, a WBS Roof System, Built-up Membrane Roofing (0.05.01), is set at the assembly level. At this point the inspector would select the type of assembly based on a preselected picklist. (Such a picklist at the assembly level might include various roof assembly groupings; eg., 3 to 5-ply asphalt with gravel coating and composite insulation.) If a more detailed inspection is required, the inspector would "de-select" the base CAS assembly level by crossing through the LVL Box "Assy." This action would bring up the next level "component." In our roof example, this would mean that the inspector would now assess the membrane, flashing, and insulation as separate components. As with the assembly level, the inspector would choose a type from a selected picklist for each component. Although IUs are usually determined prior to the survey, multiple IUs may also be developed during the inspection. For example, a WBS of the south quadrant built-up roof may be divided into two IUs (eg., sw corner and remaining roof) if the inspector chooses to highlight and isolate some abnormal conditions from the main IU.

Additional information developed on this screen would include the percentage of WBS served by the IU, the estimated quantity (this figure will also be independently generated by CAIS status (see subsection 1.1), estimated life remaining useful without repair (WOR), and estimated age.

SURVEY STEP: DEFICIENCY ASSESSMENT SCREEN 4.1

With the WBS and IU established, the inspector now conducts the CAS inspection for each WBS IU. As the inspector surveys the asset, a preformatted picklist containing all deficiencies that may affect the particular WBS IU is reviewed. The default setting shows a zero in each coverage block, indicating no deficiencies. As the survey proceeds, the inspector "de-selects" this normal setting by entering a percentage of coverage under condition categories listed (light, moderate, severe, and fail). For example, inspector entries for WBS roofing, IU built-up membrane, deficiency 'splitting" of 10% light, 0% moderate, 0% severe, 0% fail, would be interpreted by CAIS software as 90% normal, and light splitting occurring over 10% of the membrane. If the inspector cannot determine the condition using standard inspection methods, he can indicate the need for a non-standard inspection (NSIP) by de-selecting the "NO" in the NSIP column. To complete the inspection, the aforementioned procedures would be carried out for each deficiency noted by the inspector.

DATA COLLECTION METHODS

ENTERING DATA: DATA COLLECTION MENU (Continued)

SURVEY STEP: SUMMARY CONDITION ASSESSMENT SCREEN 5.0

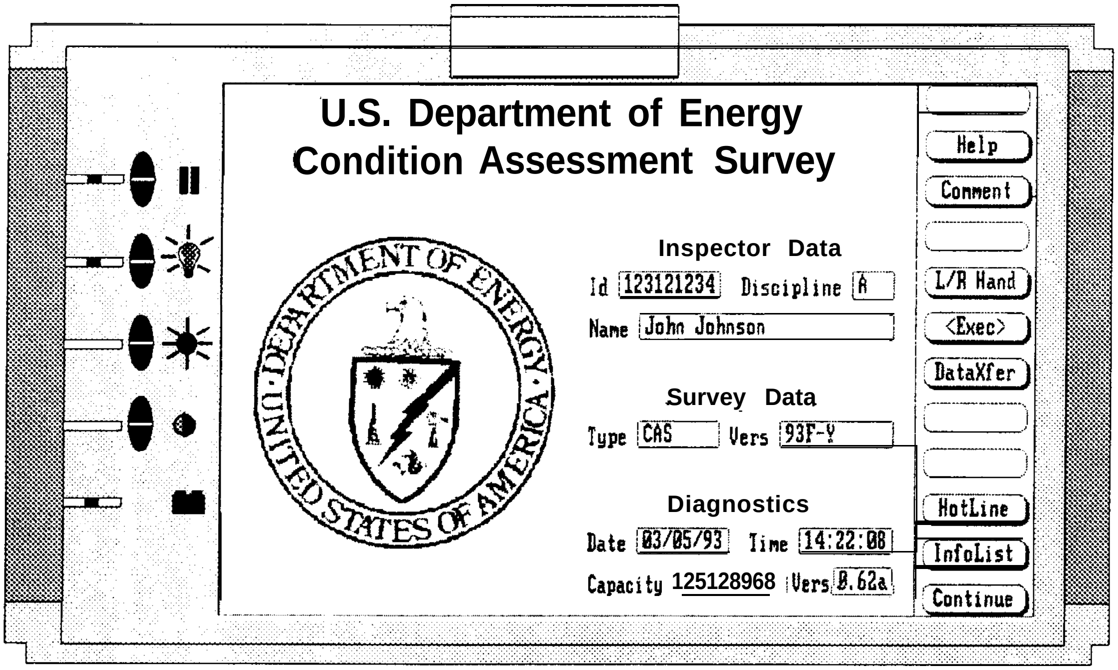
This final screen summarizes the WBS IU in three major categories: urgency, purpose, and condition. In each category, the inspector will call up a picklist and select the category he feels is most appropriate for the WBS IU surveyed. (For the purpose category, the inspector may select multiple headings.) Additionally, the inspector may elect to enter an estimated cost and/or quantity. (This is optional as CAIS will generate these data based on the inspector's survey information.) The inspector will also enter an estimated remaining life post-repair. As an option, a work order may be generated based on the CAS survey information. This option is generated by selecting the WORK ORDER function key and filling out pertinent data. Finally, the inspector may choose to describe the repair more fully by selecting the REPAIR CHARACTER key.

After completing all WBS IUs, the CAS inspection for the system is complete. This procedure is repeated for each applicable system. Once all systems for the asset are complete, the information is uploaded to the PC-based CAIS program for data analysis and report generation.

In the remainder of this subsection, actual data screens, as they will appear to the inspector, are displayed to illustrate a typical inspection. As previously noted, five main screens are used in the system supported by numerous "pop-up" lists, information, comment, and other auxiliary screens. In our examples, main screens are numbered 1.0 - 5.0; secondary screens are labeled 1 .1, 1.2, etc.; and general support screens use the series 99.0. Key inspector actions on each screen are highlighted. Support function keys are listed below these main functions.

SURVEY STEP LOGIN

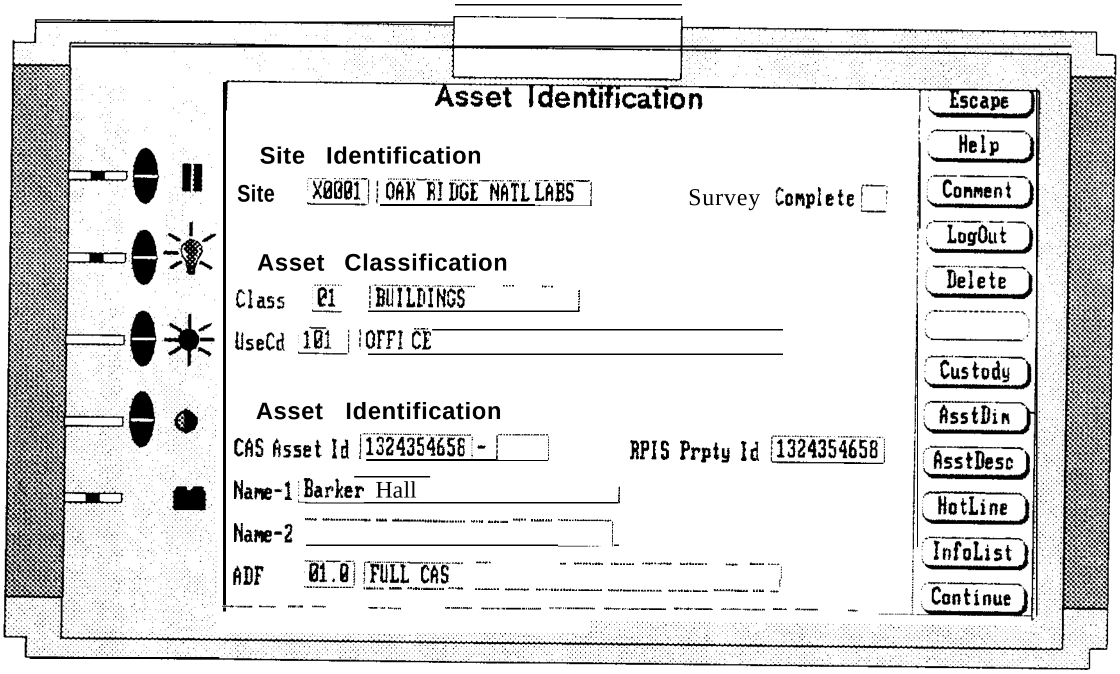
Screen 1 .0



SCREEN	ACTION	COMMENT
1.0	1. Enter Name and Employee Id #	May be preloaded for security
	2. Tap "Discipline" title for picklist, cursor select or enter by pen	Picklist preformatted A=Arch, C=Site/Civil, E=Elec, M=Mech
	3. Tap "Type" and "Vers" title under Survey Data for picklist cursc select or enter by pen	Picklist preformatted for type of survey to be performed and version date for record
	4. Diagnostics data is system generated and for information purposes only	N/A
	5. Press (Continue) to go to Screen 2.5	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information.
(Help)	Press to bring up screen help	Screen 99.1
(Comment)	Press to bring up screen for entering inspector comments	Screen 99.2
(LH/RH)	Press to change screen between Left or Right Hand use	N/A
(<Exec>)	Press to exit to the Grid System Menu	This option can be password protected
(DataXfer)	Press to transfer data to site computer	Used for data upload/download procedures
(Hotline)	Press for important contacts and telephone numbers	Screen 99.3
(InfoList)	Press to bring up information/directions preloaded for inspector	Screen 99.4

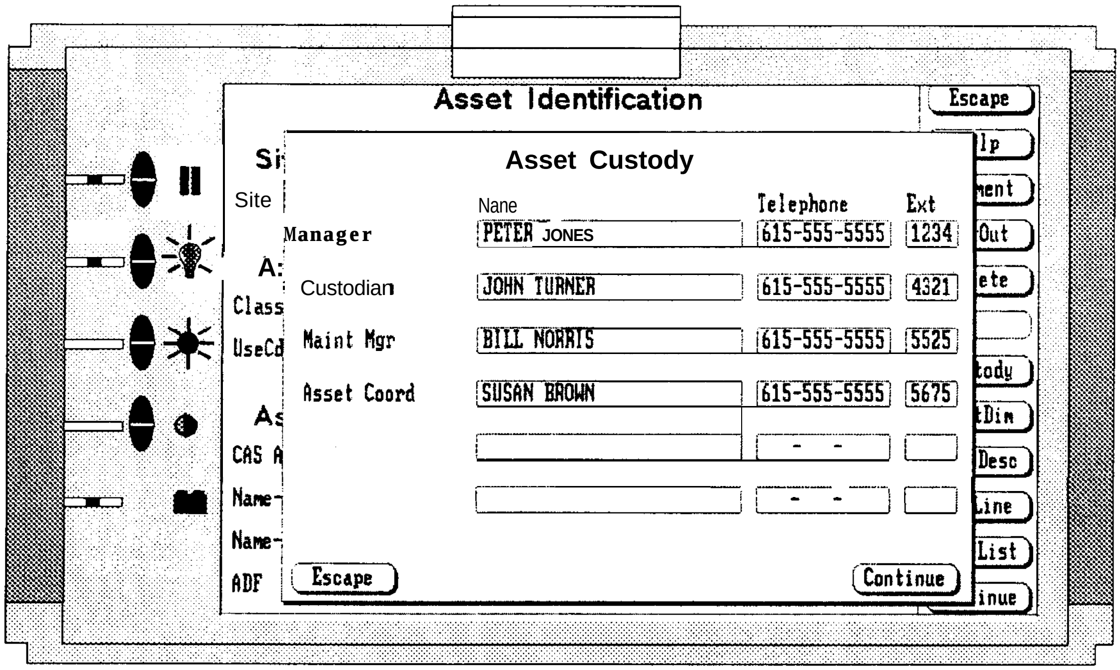
SURVEY STEP ASSET IDENTIFICATION

Screen 2.0



SCREEN	ACTION	COMMENT
2.0	1. Tap "Site" title for picklist Cursor select or enter by pen	Picklist can be preloaded, site code appears automatically to match name selected
	2. Tap "Class" title for picklist Cursor select or enter by pen or skip to item 4	Picklist preformatted based on RPIS categories
	3. Tap "Use Cd" title for picklist Cursor select or enter by pen or skip to item 4	Picklist preformatted based on RPIS categories
	4. Enter Asset Identification information by selecting "CAS Asset Id" corresponding "RPIS Prpty Id" and "Name-i or Name-2" will be generated	This data can be preloaded
	5. Enter a Split Asset by creating an extension to "CAS Asset ID" and selecting a new name	fhii data can be preloaded or created by inspector
	6. Enter Asset Determinant Factor "ADF" provided by Site Mgr.	Determined by Site Manager prior to survey
	7. Press box next to Survey Complete upon completion of Asset survey	N/A
	8. Press Continue to go to Screen 3.0	By pressing Continue information is verified; corrections made by crossing through data and entering new information
Escape	Press to return to Screen 1.0	By pressing-information is not verified and any changes made are lost
Help	Press to bring up screen help	Screen 99.1
Comment	Press to bring up screen for entering inspector comments	Screen 99.2
Logout	Press to save all data entered end leave survey	N/A
Custody	Press to bring up asset contact names	Screen 2.1 This data can be preloaded
AssetDim	Press to bring up screen for entering or verifying key asset dimensions	Screen 2.2 This data can be preloaded
AssetDes	Press to bring up screen for entering or verifying asset name, address and descriptions	Screen 2.3 This data can be preloaded
HotLine	Press for important contacts and telephone numbers	Screen 99.3
InfoList	Press to bring up information/direction preloaded for inspector	Screen 99.4

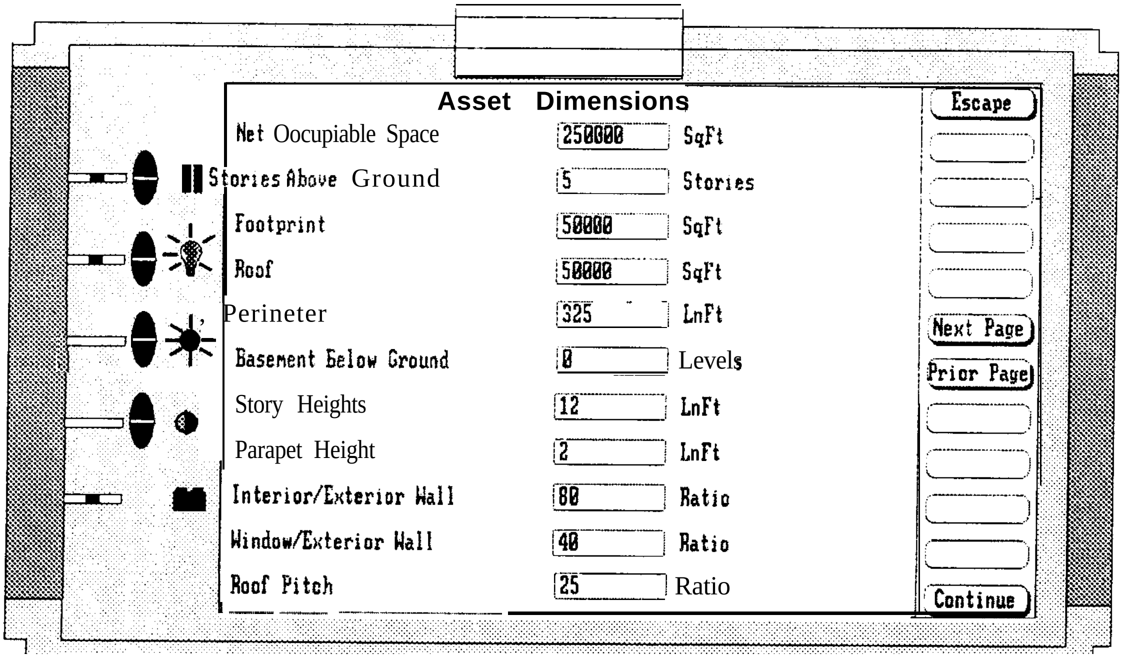
SURVEY STEP ASSET CUSTODY SCREEN **Screen 2.1**



SCREEN	ACTION	COMMFNT
2.1	1. Pop up window displays important names and numbers for asset. Cross through data and make any changes	Data can be either preloaded or inspector generated.
	2. Press (Continue) to return to Screen 2.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information.
(Escape)	Press to return to Screen 2.0	By **pressing** (Escape) **information** is not **verified** and any changes made are lost.

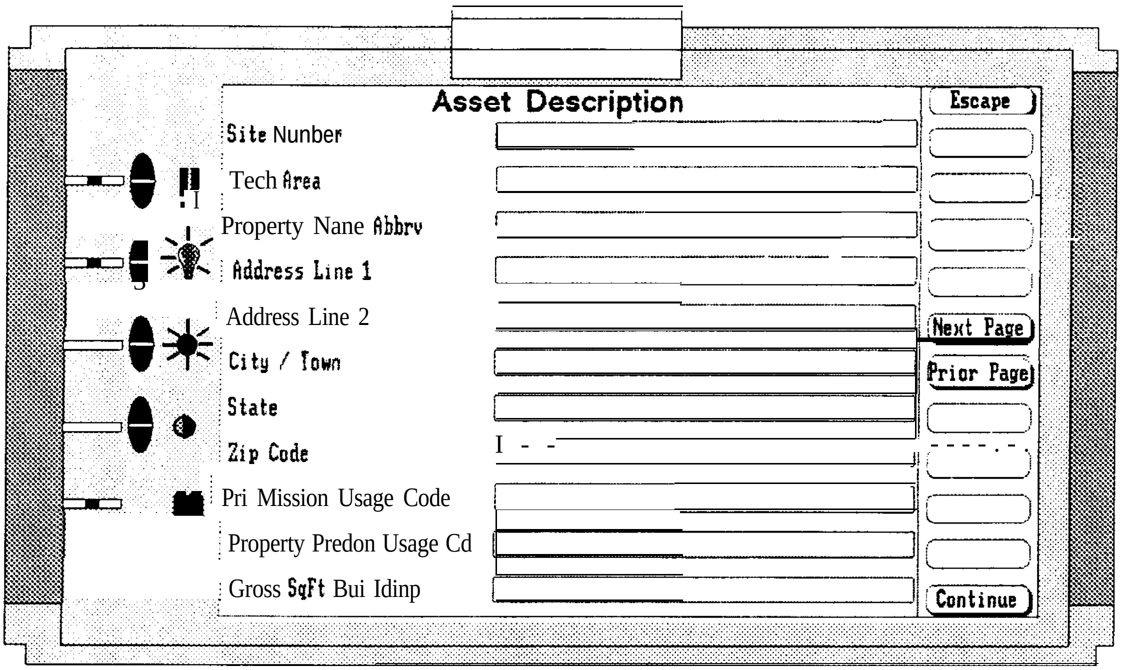
SURVEY STEP ASSET DIMENSIONS

Screen 2.2



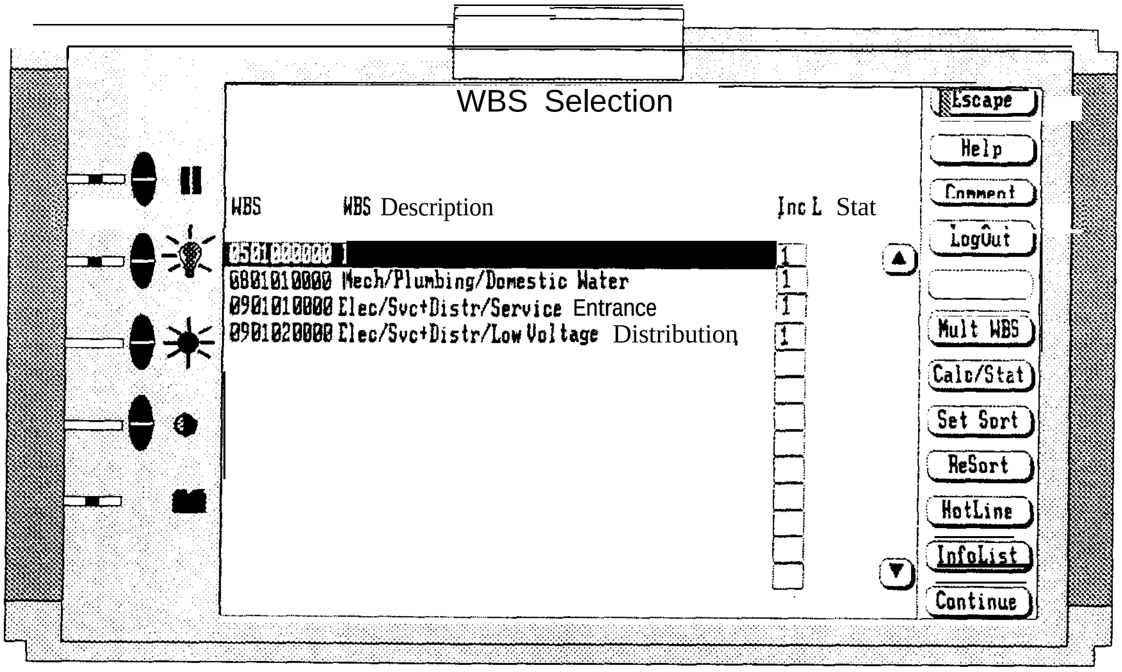
SCREEN	ACTION	COMMENT
2.2	1. Screen displays important dimension related to the asset verify data or cross through data and make any changes	Data can be either preloaded or inspector generated.
	2. Press (Continue) to return to Screen 2.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information.
(Escape)	Press to return to Screen 2.0	By pressing (Escape) information is not verified and any changes made are lost.
(NextPage)	Press to bring up next screen of important dimensions	Data can be either preloaded or inspector generated.
(PriorPage)	Press to return to previous asset dimension screen	Data can be either preloaded or inspector generated.

SURVEY STEP ASSET DESCRIPTION Screen 2.3



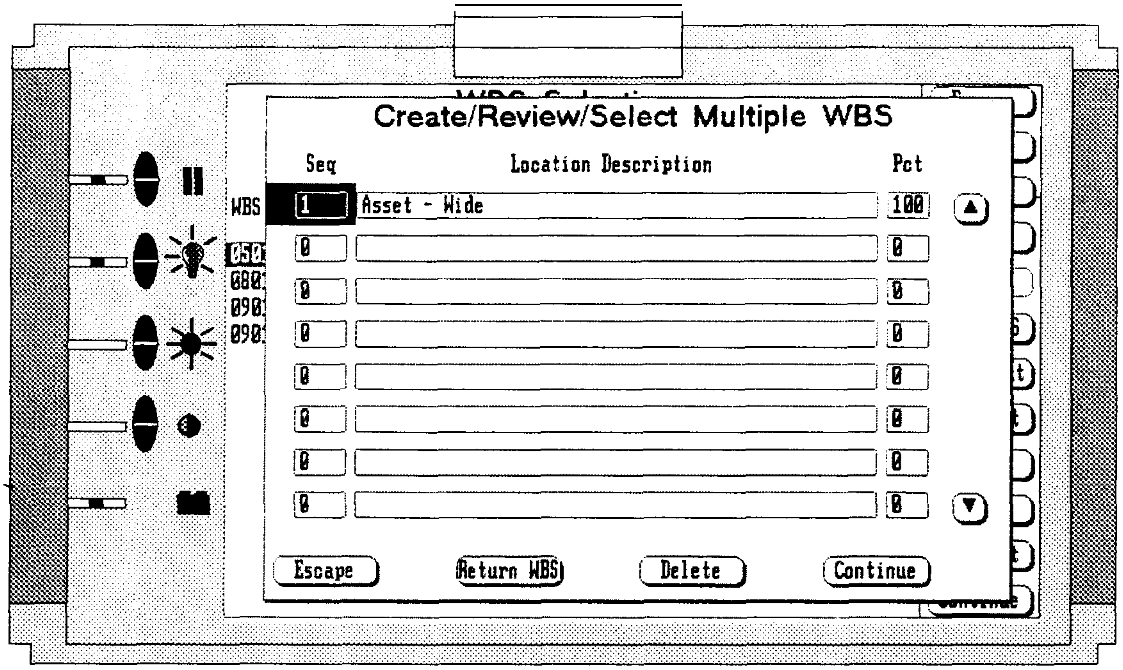
SCREEN	ACTION	COMMENT
2.3	1. Screen displays important asset description information verify data or cross through and make changes	Data can be either preloaded or inspector generated
	2. Press (Continue) to return to Screen 2.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information
(Escape)	Press to return to Screen 2.0	By pressing-information is not verified and any changes made are lost
(NextPage)	Press to bring up next screen of important descriptions	Data can be either **preloaded** or inspector generated
(PriorPage)	Press to return to previous asset description screen	Data can be either **preloaded** or inspector generated

SURVEY STEP WBS SELECTION Screen 3.0



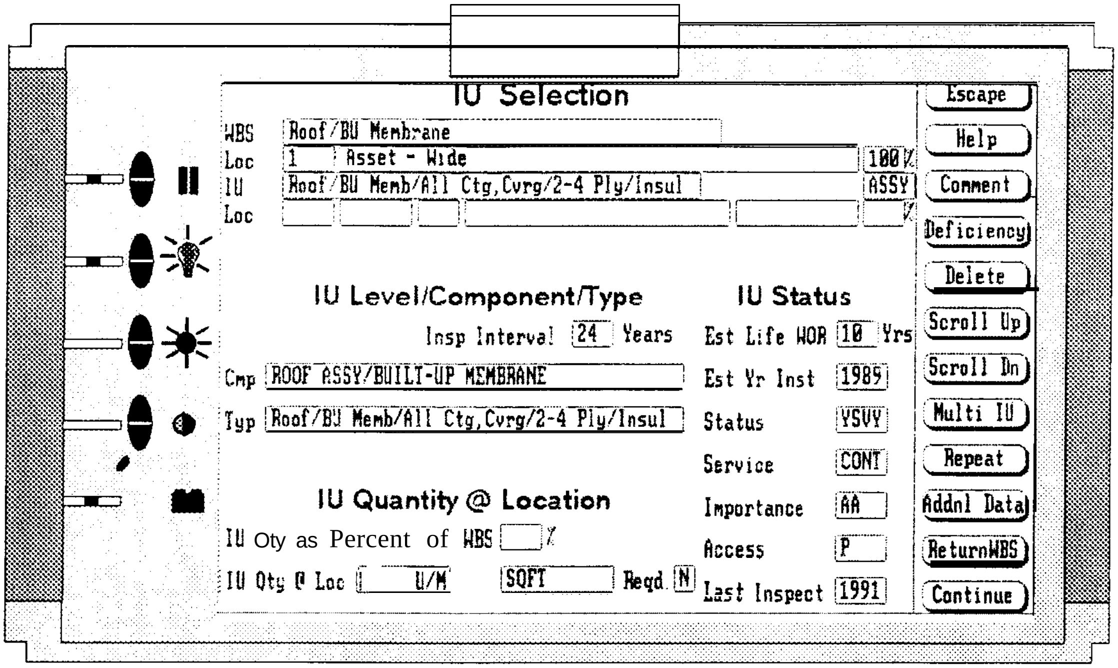
SCREEN	ACTION	COMMENT
3.0	1. Select WBS item to inspect from picklist	Picklist preformatted and is presorted by ADF numbers. Columns at end of WBS list show; "inc" (included) by sort order 1,2,3...; "M" (multiple items); and "Stat" (Status) (In Progress, Complete, or Not Started [*])
	2. All WBS for ADF included on screen; cross through number in "inc" column to deselect	By crossing through "inc" number, WBS item is deselected
	3. Press (Continue) to go to Screen 4.0	By pressing (Continue) information is verified and inspections units under the selected WBS are loaded
(Escape)	Press to return to Screen 2.0	By pressing (Escape) information is not verified and any changes made are lost.
(Help)	Press to bring up screen help	Screen 99 .1
(Comment)	Press to bring up screen for entering inspector comments	Screen 99.2
(Logout)	Press to save all data entered and leave survey	N/A
(Multi WBS)	Press to create. view or select multiple WBS and locations	Screen 3.1
(CalcSort)	Press to recalculate the status of or number of multiple locations	N/A
(SetSort)	Resets the sort sequence of systems, etc. by accessing a pop-up window	N/A
(Resort)	Press to resort list in order of priority of WBS items selected	N/A
(HotLine)	Press for important contacts and telephone numbers	Screen 99.3
(InfoList)	Press to bring up information/directions preloaded for inspector	Screen 99.4
▲	Press Scroll Up button	Used to scroll up through information.
▼	Press Scroll Down button	Used to scroll down through information.

SURVEY STEP CREATE/REVIEW/SELECT MULTIPLE WBS Screen 3.1



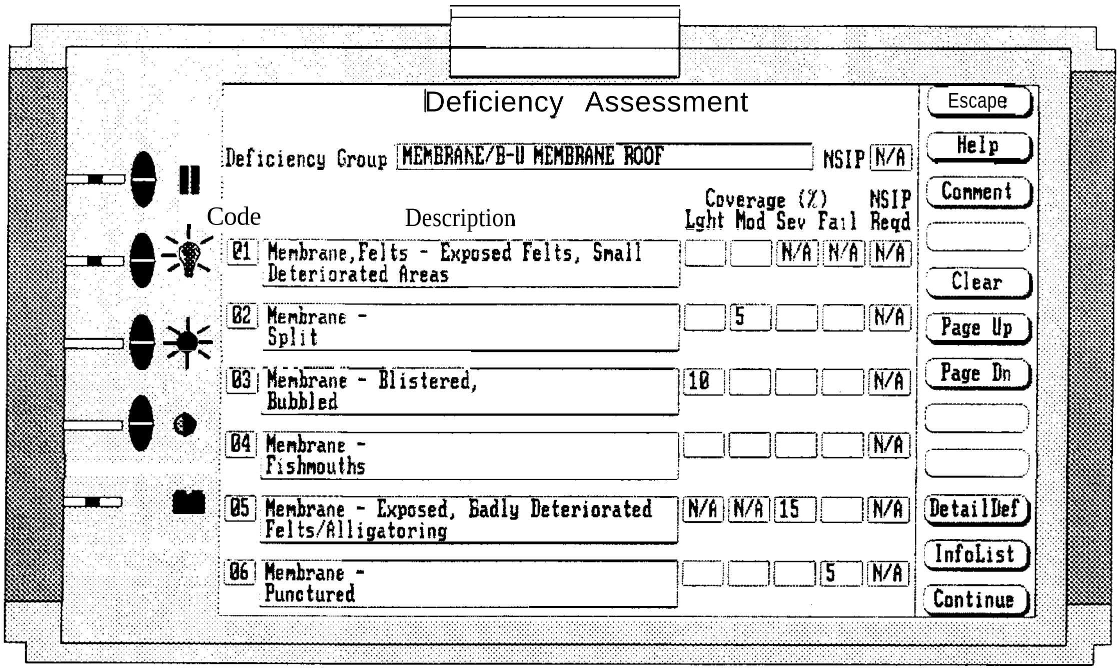
SCREEN	ACTION	COMMENT
3.1	1. Define locations of multiple WBS. Could be multiple systems or multiple parts of single system.	Inspector developed
	2. Define percentage of Asset serviced by WBS section	Inspector developed
	3. Press (Continue) after selecting multiple WBS locations from list and continue to Screen 4.0 to select Inspection Unit (IU).	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information or selecting another item
(Escape)	Press to return to Screen 3.0	By pressing (Escape) information is not verified and any changes made are lost
(RtrnWBS)	Press to return to WBS selection screen to make additional selections	N/A
(Delete)	Press to delete a highlighted entry on screen	N/A
▲	Press scroll up button	Used to scroll up through information.
▼	Press scroll down button	Used to scroll down through information.

SURVEY STEP IU SELECTION Screen 4.0



SCREEN	ACTION	COMMENT
4.0	1. Tap "Cmp" title for component picklist Cursor select or enter by pen	Picklist is preformatted
	2. Tap "Typ" title for type of component picklist Cursor select or enter by pen	Picklist is preformatted
	3. Press (Deficiency) to bring up deficiency assessment screen	Screen 4.1 brings up deficiency picklist for WBS IU
	4. Enter estimated life without repair	Inspector generated
	5. Enter estimated year "IU" installed	Inspector generated
	6. Tap "Status" title for picklist Cursor select or enter by pen	Picklist is preformatted
	7. Tap "Service" title for picklist Cursor select or enter by pen	Picklist is preformatted
	8. Tap "Importance" title for picklist	Picklist is preformatted
	9. Tap "Access" title for picklist Cursor select or enter by pen	Picklist is preformatted
	10. Enter year "IU" last inspected	Inspector generated
	11. Enter percentage of WBS served by inspection unit	Inspector generated
	12. Enter quantity of inspection unit at location as required	Inspector generated
	13. Press (Continue) to go to Screen 5.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information
(Escape)	Press to return to Screen 3.0	By pressing (Escape) information is not verified; and any changes made are lost
(Help)	Press to bring up screen help	Screen 99.1
(Comment)	Press to bring up screen for entering inspector comments	Screen 99.2
(Delete)	Press to delete an inspection unit record	N/A
(Scroll Up)	Press to scroll up thru inspection units selected	N/A
(Scroll Dn)	Press to scroll down thru inspection units selected	N/A
(Multi IU)	Press to create, view, or select multiple IU's and locations	Screen 4.2
(Repeat)	Press to repeat or copy inspection unit selection data as a new entry	N/A
(AddnlData)	Press to bring up Additional Data screen and enter boiler plate information	Screen 4.3 - Inspector generated
(RtrnWBS)	Press to save data entered and go to Screen 3.0 for next selection	By pressing (RtrnWBS) information is verified: corrections made by crossing through data and entering new information

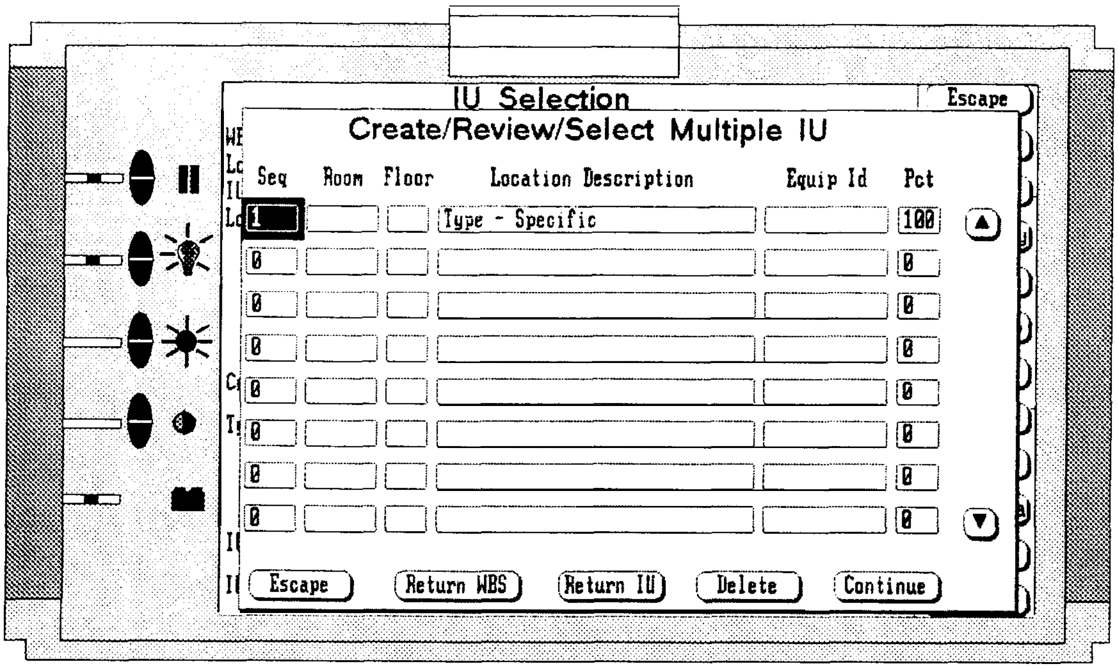
SURVEY STEP DEFICIENCY ASSESSMENT Screen 4.1



SCREEN	ACTION	COMMENT
4.1	1. Select deficiency from fist	Picklist preformatted
	2. Select degree of severity of deficiency	Inspector developed
	3. Enter percentage of coverage under selected severity	Inspector developed
	4. Indicate whether non-standard inspection/test procedures are required or recommended	Inspector choice, preset at "No": line through to deselect
	5. Press (Continue) to go to Screen 5.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information
(Escape)	Press to return to Screen 4.0	By pressing (Escape) information is not verified and any changes made are lost
(Help)	Press to bring up screen help	Screen 99.1
(Comment)	Press to bring up screen for entering inspector comments	Screen 99.2
(Clear)	Press to unselect a deficiency	N/A
(Page Up)	Press to scroll up though data by page	N/A
(Page Dn)	Press to scroll down through data by page	N/A
(Detail Def)	Press to bring up long description of selected deficiency	N/A
(InfoList)	Press to bring up information/directions preloaded for inspector	Screen 99.4

SURVEY STEP CREATE/REVIEW/SELECT MULTIPLE IU

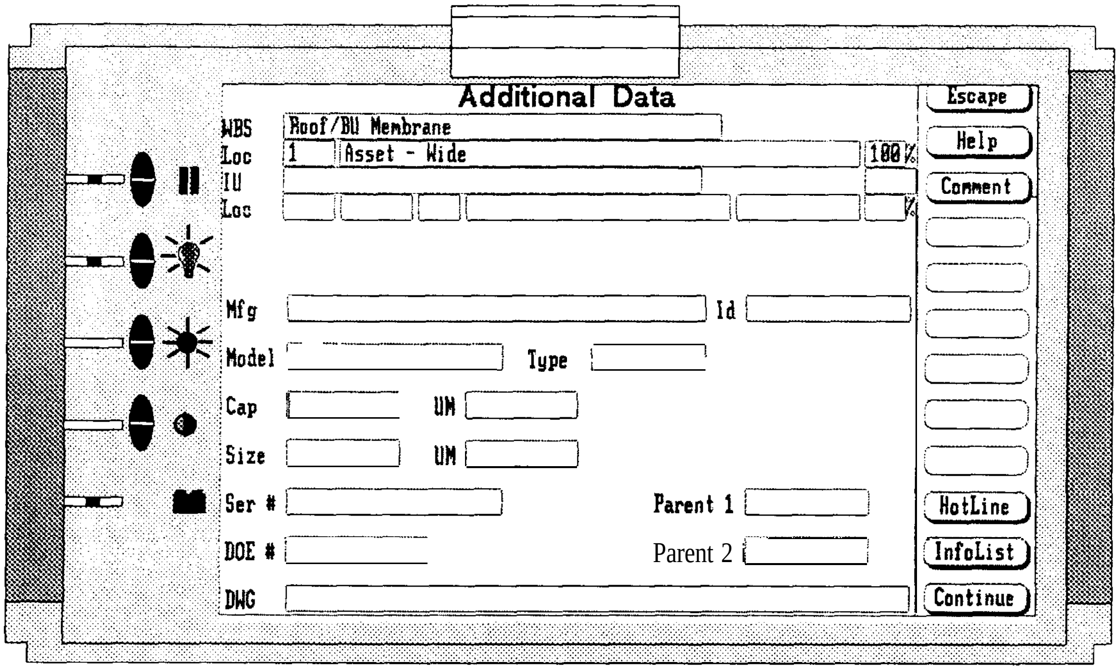
Screen 4.2



SCREEN	ACTION	COMMENT
4.2	1. Define locations of Multiple IU's by room, floor and/or location description - optional equipment identification number can be added	Inspector developed
	2. Define percentage of Asset or WBS serviced by IU	Inspector developed
	3. Press Continue after selecting Multiple IU location from list and continue to Screen 4.1 to select deficiencies	By pressing Continue information is verified; corrections made by crossing thru data and entering new information or selecting another item
Escape	Press to return to Screen 4.0	By pressing-information is not verified and any changes made are lost
RtrnWBS	Press to return to Screen 3.0	N/A
RtrnIU	Press to return to Screen 4.0	N/A
Delete	Press to delete a highlighted entry on screen	N/A
▲	Press scroll up button	Used to scroll up through information
▼	Press scroll down button	Used to scroll down through information

SURVEY STEP ADDITIONAL DATA

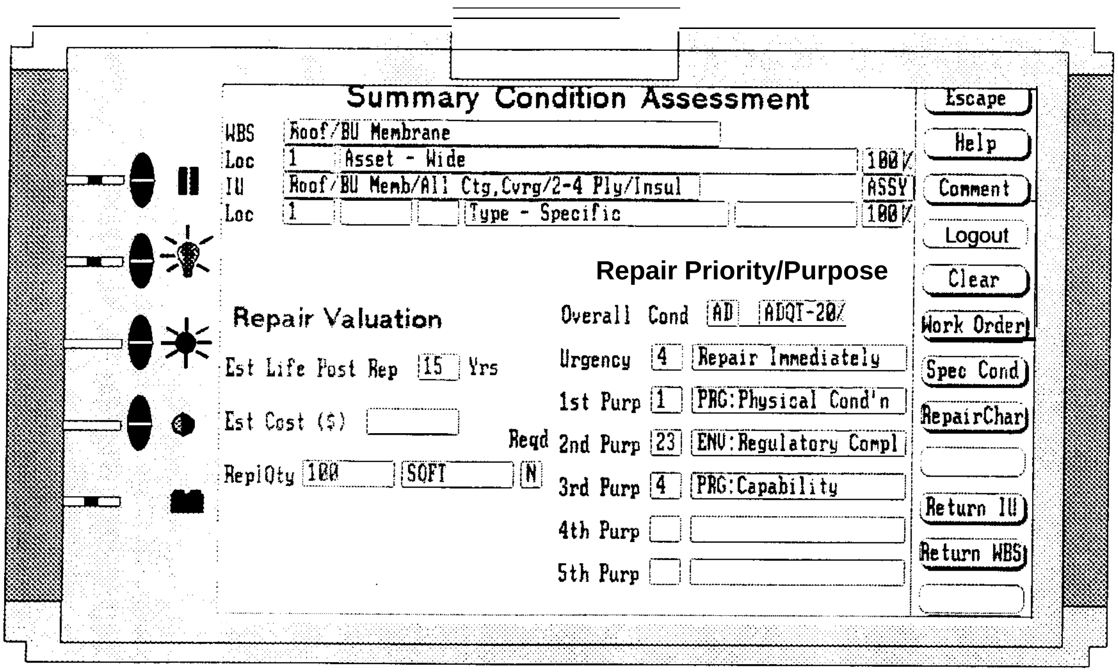
Screen 4.3



SCREEN	ACTION	COMMENT
4.3	1. Enter boiler plate data about component being inspected	Inspector generated from data on the component, drawing specifications or determined in the field. This data can be used for inventorying inspection units
	2 Press (Continue) to go to Screen 4.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information
(Escape)	Press to return to Screen 4.0	By **pressing** (Escape) **information** is not verified; and any changes made are **lost**
(Help)	Press to bring up screen help	Screen 99.1
(Comments)	Press to bring up screen for entering inspector comments	Screen 99.2
(Hotline)	Press for important contacts and telephone numbers	Screen 99.3
(InfoList)	Press to bring up information/directions preloaded for inspector	Screen 99.4

SURVEY STEP SUMMARY CONDITION ASSESSMENT

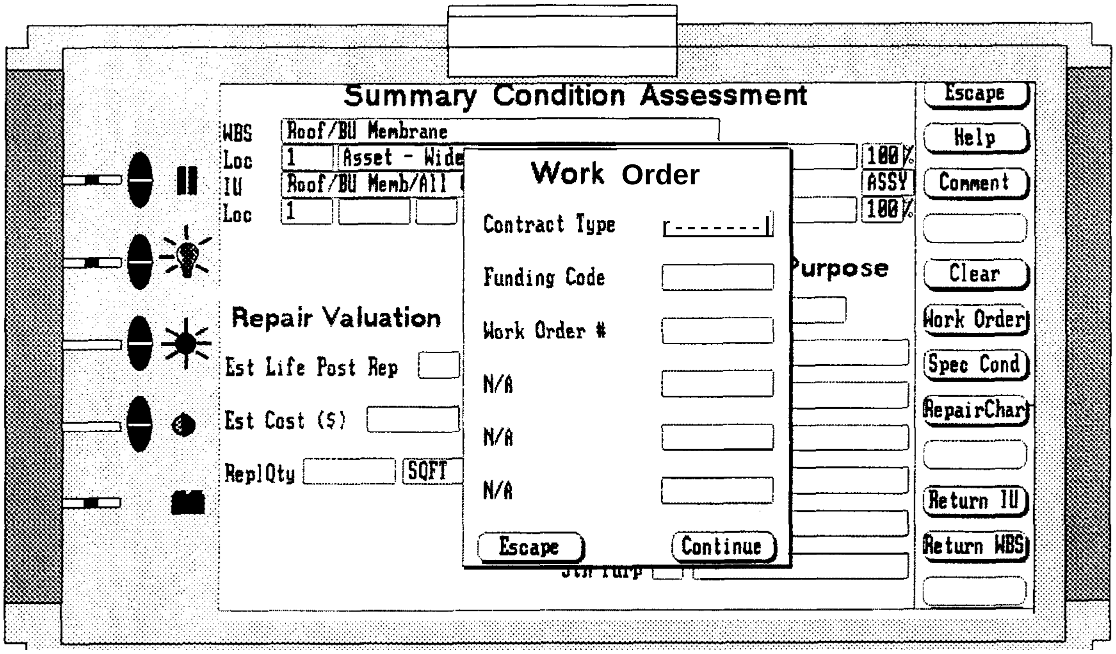
Screen 5.0



SCREEN	ACTION	COMMENT
5.0	1. Tap "Overall Condition" title for picklist Cursor select or select by pen	Picklist preformatted, inspector determined
	2. Tap "Urgency" tile for picklist Cursor select of enter by pen	Picklist preformatted, inspector determined
	3. Tap "Purp" title for picklist Cursor select or enter by pen Multiple purposes can be specified	Picklist preformatted inspector determined
	4. Enter estimated life of NJ after repairs in years	Inspector determined
	5. Enter an estimated cost for repairs (optional)	Inspector determined
	6. Enter repair quantity as required	Inspector determined
	7. Press to save data entered and go to Screen 4.0 for next selection	By pressing (ReturnIU) information is verified; corrections made by crossing through data and entering new information
	8. Press to save data entered and go to Screen 3.0 for next selection	By pressing (ReturnWBS) information is verified; corrections made by crossing through data and entering new information
(Escape)	Press to return to Screen 4.0	By pressing (Escape) information is not verified and any changes made are lost
(Help)	Press to bring up screen help	Screen 99.1
(Comment)	Press to bring up screen for entering inspector comments	Screen 99.2
(Logout)	Press to save all data entered and leave survey	N/A
(Clear)	Press to clear or delete an entry	N/A
(Work Order)	Press to bring up work order screen pop-up	Screen 5.1
(Spec Cond)	Press to bring up special condition screen pop-up	Screen 5.2
(Repair Char)	Press to bring up special repair characteristics screen pop-up	Screen 5.3

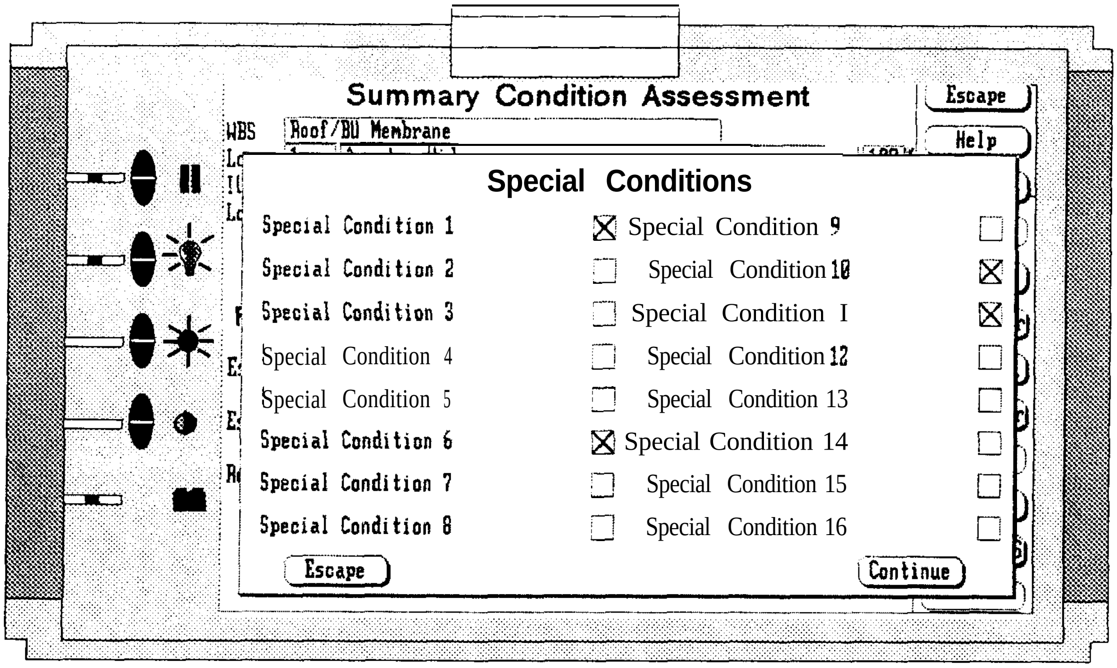
SURVEY STEP WORK ORDER GENERATION

Screen 5.1



SCREEN	ACTION	COMMENT
5.1	1. Enter data to define Work Order number to tag repair to create a job estimate for repairs	Inspector generated as determined by Site Manager prior to survey
	2. Press (Continue) to go to Screen 5.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information
	3. Press (Escape) to return to Screen 5.0	By pressing (Escape) information is not verified; and any changes made are lost

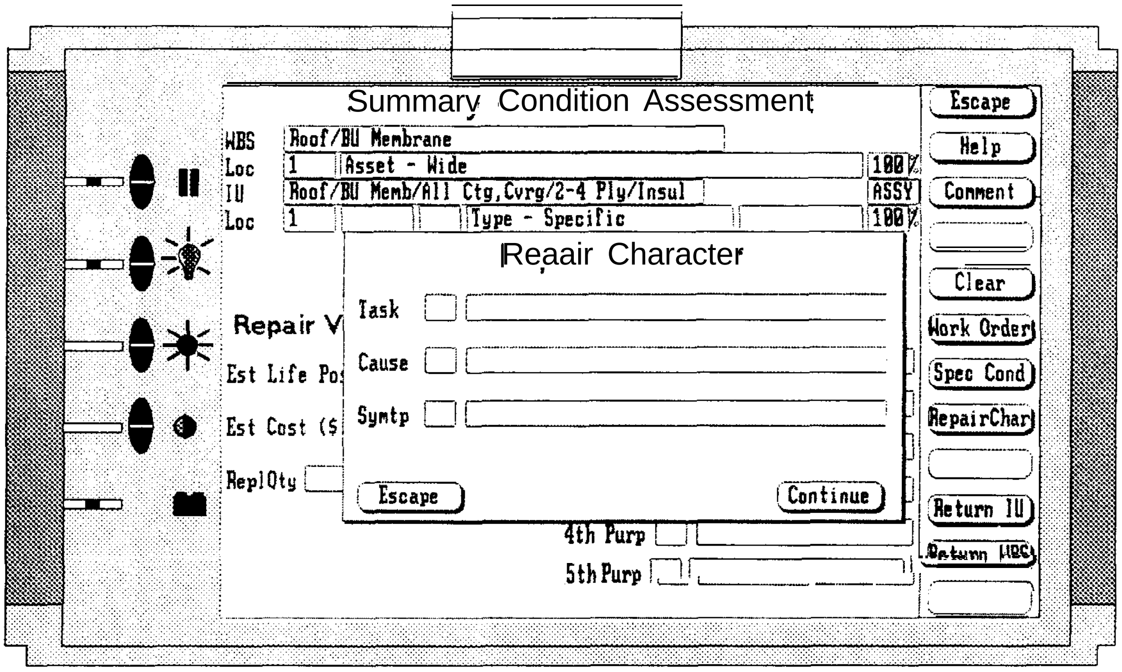
SURVEY STEP SPECIAL CONDITIONS SELECTION Screen 5.2



SCREEN	ACTION	COMMENT
5.2 :	1. Press box next to special condition to select	Picklist is preloaded by site. Selections determined by Site Manager prior to survey
	2 Press (Continue) to go to Screen 5.0	By pressing (Continue) information is verified; corrections made by crossing through data and entering new information
	3. Press-to return to Screen 5.0	By pressing (Escape) information is not verified; and any changes made are lost

SURVEY STEP REPAIR CHARACTER DOCUMENTATION

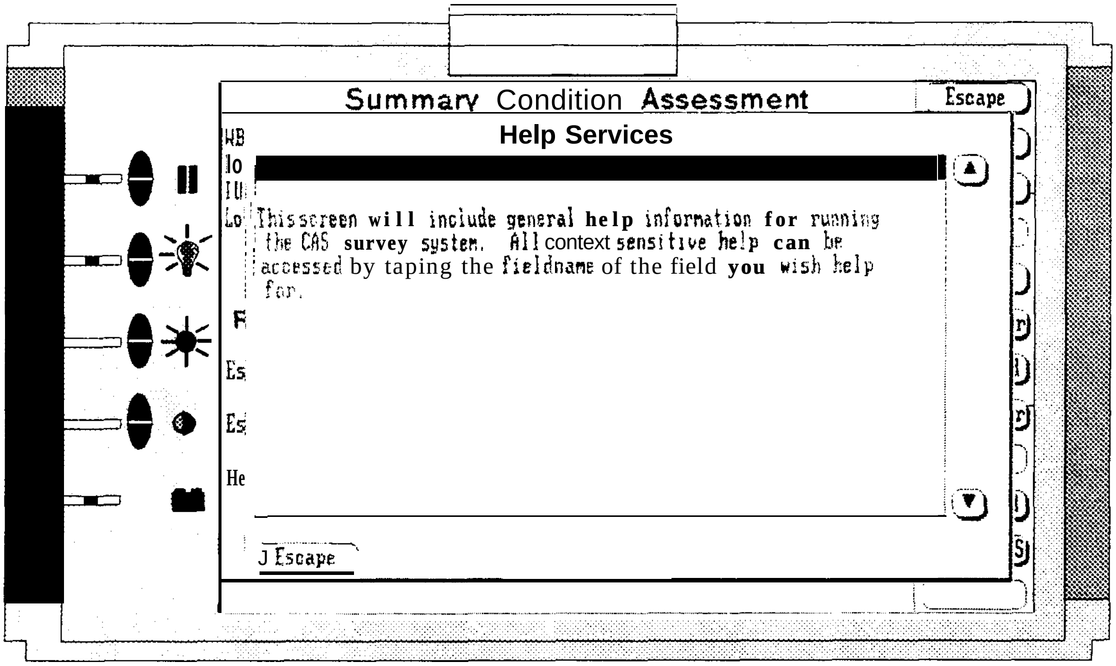
Screen 5.3



SCREEN	ACTION	COMMENT
5.3	1. Enter repair characteristics for tracking related deficiencies	Inspector generated from input of asset users to document what is deficient, what caused deficiency and any symptoms. Picklist can be preformatted
	2. Press Continue to go to Screen 5.0	By pressing Continue information is verified; corrections made by crossing through data and entering new information
	3. Press-to return to Screen 5.0	By pressing Escape information is not verified; and any changes made are lost

SURVEY STEP HELP

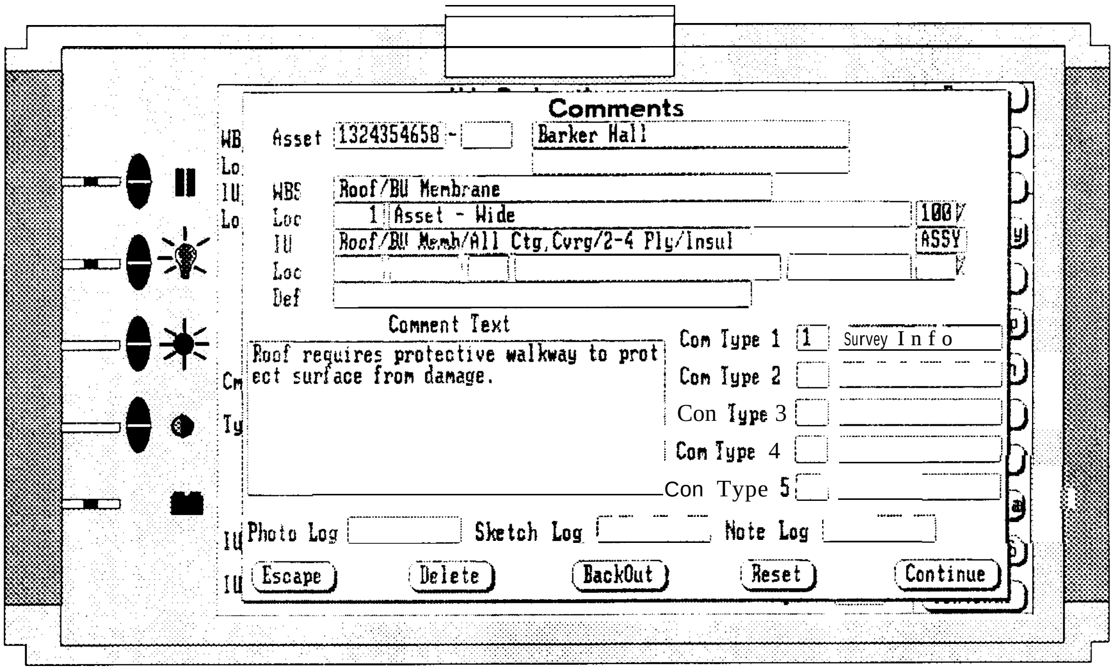
Screen 99.1



SCREEN	ACTION	COMMENT
99.1	N/A	Screen pop-up help information Dynamic help for locations selected Screen data cannot be changed
Escape	Press to exit Help Screen and return to previous screen	N/A
▲	Press scroll up button	Used to scroll up through information
▼	Press scroll down button	Used to scroll down through information

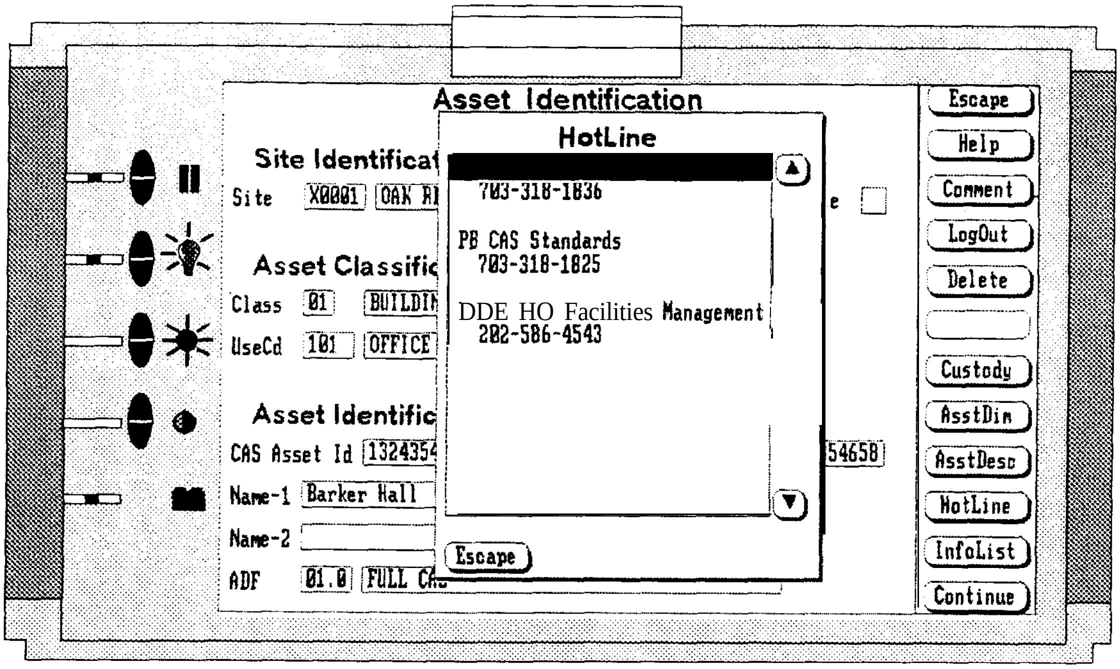
SURVEY STEP COMMENT SCREEN

Screen 99.2



SCREEN	ACTION	COMMENT
99.2	1. Select a Comment Type Selection	Picklist preformatted
	2. Enter Comment inside comment text field (QWERTY keyboard can be called in to use)	Text field expands as required
	3. Enter a Photo, Sketch. or Note Log tag number	Can be standardized or inspector generated
	4. Press (Continue) to return to previous screen	By pressing (Continue) information is verified; corrections made by crossing thru data and entering new information
(Escape)	Press to exit comment screen and return to previous screen	By pressing (Escape) information is not verified and any changes made are lost
(Delete)	Press to delete a selected comment	N/A
(Backout)	Press to move backwards through the navigation screen at top	This option allows an inspector to move backwards to enter or change a comment tagged to a previous screen
(Reset)	Press to move forward through the navigation screen at top	This option allows an inspector to move forward after entering a comment on a previous screen to continue the inspection

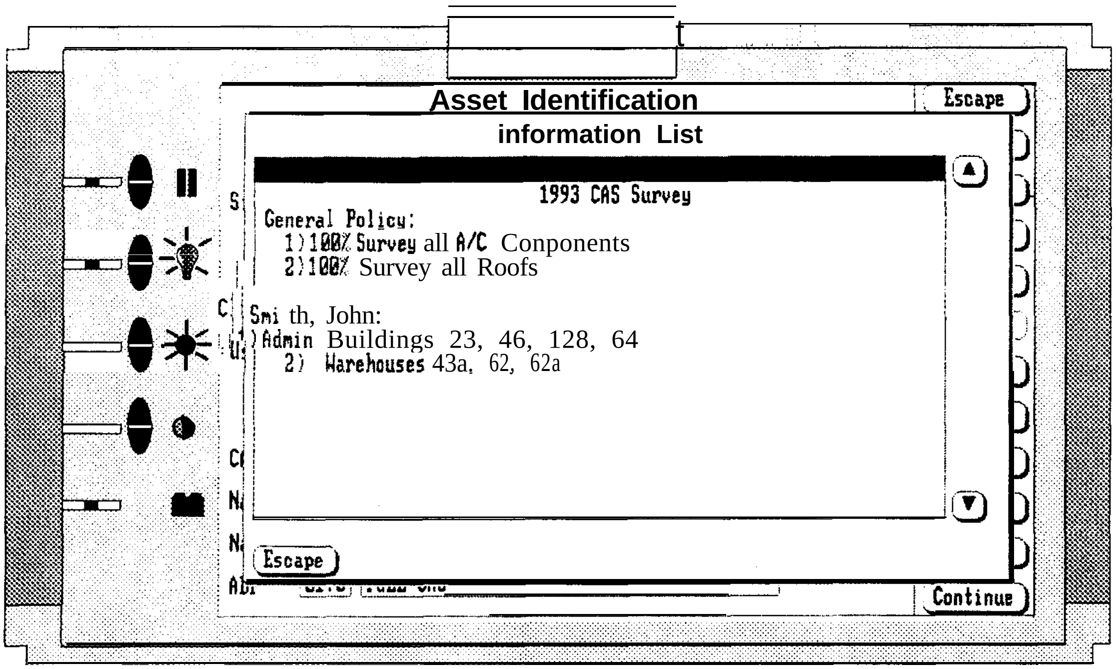
SURVEY STEP HOTLINE SCREEN Screen 99.3



SCREEN	ACTION	COMMENT
99.3	N/A	Screen pop-up for important contacts and telephone numbers Preformatted and adjusted by Site Manager. Screen data cannot be changed by inspector
(Escape)	Press to exit Hotline screen and return to previous screen	N/A
	Press scroll up button	Used to scroll up through information
	Press scroll down button	Used to scroll down through information

SURVEY STEP INFO SCREEN

Screen 99.4



SCREEN	ACTION	COMMENT
99.4	1. CAS inspection parameters & schedules as inputted by site manager	Cannot be changed by inspector
(Escape)	Press to exit InfoList screen and return to previous screen	N/A
▲	Press scroll up button	Used to scroll up through information
▼	Press scroll down button	Used to scroll down through information

DATA COLLECTION METHODS

END OF SUBSECTION

FEDERAL SPECIFICATIONS

FEDERAL SPECIFICATION	TITLE
FED-STD 66	Steel, Chemical Composition and Hardening Ability
FED-STD 372	Test for Critical Radiant Flux of Carpet Flooring Systems (Flooring Radiant Panel Test)
FS FF-H-106	Hardware, Builders Locks and Door Trim
FS FF-H-1619	Hardware, Builders, Auxiliary Locks
FS HH-I-556	Insulation Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering) and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)
FS HH-Y-622	Mortar, Refractory, Heat Setting, Bonding (Wet and Dry Types)
FS L-S-125	Screening, Insect, Nonmetallic
FS MM-L-736	Lumber, Hardwood
FS MM-L-751	Lumber, Softwood
FS MMM-A-001993	Adhesive, Epoxy, Flexible, Filled (for Binding, Sealing and Grouting)
FS QQ-C-40	Caulking: Lead Wool and Lead Pig
FS QQ-S-763	Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting
FS ma-s-775	Steel Sheets, Carbon, Zinc-Coated (Galvanized) by the Hot-Dip Process
FS QQ-W-461	Wire, Steel, Carbon (Round, Bare, and Coated)
FS RR-D-575	Door, Metal, Sliding and Swinging: Door Frame, Metal (Flush and Semiflush)
FS ss-c-153	Cement, Bituminous Plastic
FS SS-C-158	Federal Specification for Cements, Hydraulic, General Specifications (methods for sampling, inspection, and testing)
FS SS-C-181	Federal Specification for Cement, Masonry
FS ss-c-192	Federal Specification for Cements, Portland (10 types)
FS ss-c-208	Federal Specification for Cement, Portland, Pozzolana
FS ss-P-00402	Plaster, Gypsum
FS ss-s-210	Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints
FS SS-T-312	Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition
FS ss-w-40	Wall Base: Rubber, and Vinyl Plastic
FS I-r-c-490	Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings
FS I-r-c-494	Coating Compound, Bituminous, Solvent Type, Acid Resistant
FS TT-C-498	Coating Compound, Bituminous, Fillers, Solvent Type, Aluminum Pigmented
FS I-r-c-535	Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry
FS TT-C-542	Coating, Polyurethane, Oil-Free, Moisture Curing
FS I-r-c-555	Coating, Textured (for Interior and Exterior Masonry Surfaces)
FS TT-C-00598	Caulking Compound, Oil and Resin Base Type (for Building Construction)
FS TT-C-1 796	Caulking Compounds, Metal Seam and Wood Seam
FS TT-E-487	Enamel: Floor and Deck
FS TT-E-489	Enamel, Alkyd, Gloss, Low Voc Content
FS TT-E-490	Enamel, Silicone Alkyd Copolymer, Semiglass (For Exterior and Interior Nonresistant Use)
FS TT-E491	Enamel, Glass, Synthlic (for Metal and Wood Furniture)
FS I-r-E-496	Enamel: Heat-Resisting (400°F), Black

FEDERAL SPECIFICATIONS

FEDERAL **SPECIFICATION**	TITLE
FS **TT-E-505**	Enamel (Odorless, Alkyd, Interior, High Gloss)
FS **TT-E-506**	Enamel, Alkyd, Gloss, Tints and White (for Interior Use)
FS I-r-E-508	Enamel, Interior (Semi-Gloss, Tints and White)
FS I-I-E-509	Enamel, Odorless, Alkyd, Interior, Semigloss, White and Tints
FS IT-E-545	Primer (Enamel-Undercoat, Alkyd, Odorless, Interior/Flat, Tints and White)
FS T-r-F-338	Filler, Wood, Paste
FS I-r-F-1 098	Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, etc.)
FS I-r-I-735	Isopropyl Alcohol
FS I-f-P-28	Paint, Aluminum, Heat Resisting (1200°F)
FS I-I-P-29	Paint, Latex
FS I-r-P-30	Paint, Alkyd, odorless, Interior, Flat, White and Tints
FS I-r-P-31	Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown
FS **TT-P-37**	Paint, Alkyd Resin, Exterior Trim, Deep Colors
FS TT-P-38	Paint, Aluminum (Ready-Mixed)
FS I-I-P-59	Paint, Ready Mixed, International Orange (Not for Residential Use)
FS IT-P-85	Paint, Traffic and Airfield Marking, Solvent Base
FS I-r-P-88	Paint, Red-Lead-Base, Ready-Mixed
FS I-r-P-91	Paint, Rubber-Base, for Interior Use (Concrete and Masonry Floors)
FS I-r-P-1 10	Paint, Traffic Black (Nonreflectorized)
FS I-r-P-1 **15**	Paint, Traffic, (Highway, White, and Yellow)
FS T-r-P-320	Pigment, Aluminum, Powder and Paste for Paint
FS I-T-P-81 5	Primer Coating: Basic Lead Silico Chromate, Ready Mixed
FS I-T-P-641	Primer, Paint Coating, Zinc Dust-Zinc Oxide for Galvanized Surfaces
FS VT-P-645	Primer, Paint, Zinc-Chromate, Alkyd Type
FS I-r-P-650	Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard, or Plaster)
FS TT-P-664	Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, Not-Complaint
FS I-I-P-00791	Putty, Linseed-Oil Type, (For Wood-Sash-Glazing)
FS I-I-P-141 1	Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls)
FS I-r-P-151 1	Paint, Latex (Gloss and Semigloss, Tints and White), (for Interior Use)
FS TT-P-1728	Paint, Latex-Base, Interior, Flat, Deep Tone
FS T-r-P-1952	Paint, Traffic and Airfield Marking, Water Emulsion Base
FS T-r-P-0021 19	Paint, Latex Base, High Traffic Area, Flat and Eggshell Finish (Low Lustre), (for Interior Use)
FS TT-R-266	Resin, Alkyd, Solutions
FS TT-S-176	Sealer, Surface, Varnish Type, Floor, Wood or Cork
FS TT-S-00227	Sealing Compound, Elastomeric Type, Multi-Component for Caulking, Sealing, and Glazing (for Buildings and Other Structures)
FS TT-S-00230	Sealing Cornpound, Elastomeric Type, Single Component for Caulking, Sealing, and Glazing (for Buildings and Other Structures)
FS TT-S-300	Shellac, Cut
FS TT-S-001543	Sealing Compound: Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures)

FEDERAL SPECIFICATIONS

FEDERAL SPECIFICATION	TITLE
FS **TT-S-001** 657	Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type (for Buildings and Other Types of Construction)
FS l-l-s-71 1	Stain; Oil Type, Wood, Interior
FS l-r-T-291	Thinner, Paint, Mineral Spirits, Regular and Odorless
FS l-r-V-51	Varnish, Asphalt
FS **TT-V-81**	Varnish, Mixing, for Aluminum Paint
FS **TT-V-85**	Varnish, Oil, (Low Sheen, Brush or Spray Application)
FS l-r-V-86	Varnish, Oil, Rubbing (for Metal and Wood Furniture)
FS l-r-v-1 09	Varnish, interior, Alkyd-Resin
FS l-r-v-1 19	Varnish, Spar, Phenolic-Resin
FS l-r-v-1 21	Varnish, Spar, Water Resisting
FS l-r-w-00571	Wood Preservation: Treating Practices
FS **TT-W-572**	Wood Preservative: Water-Repellent
FS zz-c-00811	Cushion, Carpet and Rug, Cellular Rubber
FS **ZZ-R-765/GEN**	Rubber, Silicone
FS ZZ-l-001237	Tread, Stair, Flexible and Semi-Rigid Type Rubber and Vinyl
HH-l-1972	Insulation Board, Thermal, Faced, Polyurethane or Polyisocyanurate
LLL-I-535	Insulation Board, Thermal (Cellulosic Fiber) Blocks
SS-C-450A	Cloth, Impregnated (Woven Cotton Cloth, Asphalt Impregnated, Coal-Tar Impregnated)
USCE CRD-Cl09	Field Test for Absorption by Aggregates
USCE CRD-Cl19	Test for Flat and Elongated Particles in Coarse Aggregates
USCE CRD-Cl29	Test for Particles of Low Specific Gravity in Coarse Aggregate (Sink-Float Test)
USCE **CRD-C2** 13	Test for the Presence of Sugar in Cement, Mortar, Concrete, and Aggregates
USCE CRD-C248	Corps of Engineers Specifications for Slag Cement
USCE CRD-C300	Specifications for Pigmented Membrane-Forming Compounds for Curing Concrete

FEDERAL SPECIFICATIONS

END OF SUBSECTION

NATIONAL STANDARDS

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.89	Standard Practice of Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 211.2	Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 211.3	Standard Practice for Selecting Proportions for No-Slump Concrete
ACI 301	Specifications for Structural Concrete for Buildings
ACI **304R**	Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI **305R**	Hot Weather Concreting
ACI **306R**	Cold Weather Concreting
ACI 308	Standard Practice for Curing Concrete
ACI 309	Standard Practice for Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
ACI 347R	Guide to Formwork for Concrete
ACI **506R**	Shotcrete

AMERICAN PLYWOOD ASSOCIATION (APA)

APA AFG-01	Adhesives for Field-Gluing Plywood to Wood Framing
APA Form E30	Design/Construction Guide, Residential and Commercial

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM A82	Steel Wire, Plain, for Concrete Reinforcement
ASTM AI85	Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A446	Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A496	Steel Wire, Deformed, for Concrete Reinforcement
ASTM A497	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A525	Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A641	Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C6	Specification for Normal Finishing Hydrated Lime
ASTM Cl 1	Definitions of Terms Relating to Gypsum and Related Building Materials
ASTM C29	Unit Weight and Voids in Aggregate
ASTM C31	Making and Curing Concrete Test Specimens in the Field
ASTM C31	Standard Methods of Making and Curing Concrete Test Specimens in the Field
ASTM **C33**	Concrete Aggregates
ASTM **C33**	Specification for Concrete Aggregate
ASTM C36	Specification for Gypsum Wallboard
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM **C40**	Organic Impurities in Fine Aggregates for Concrete
ASTM **C70**	Surface Moisture in Fine Aggregate
ASTM C87	Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM C88	Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM **C91**	Masonry Cement

NATIONAL STANDARDS

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM C94	Specification for Ready-Mixed Concrete
ASTM **C109**	Compressive Strength of Hydraulic Cement Mortars
ASTM C114	Chemical Analysis of Portland Cement
ASTM **C1**15	Fineness of Portland Cement by the Turbidimeter
ASTM **C117**	Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM **C1**23	Lightweight Pieces in Aggregate
ASTM **C125**	Concrete and Concrete Aggregates
ASTM C127	Specific Gravity and Absorption of Coarse Aggregate
ASTM **C128**	Test for Specific Gravity and Absorption of Fine Aggregate
ASTM **C131**	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Portland Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM **C151**	Autoclave Expansion of Portland Cement
ASTM C156	Water Retention by Concrete Curing Materials
ASTM C171	Sheet Materials for Curing Concrete
ASTM C172	Standard Method of Sampling Freshly Mixed Concrete
ASTM **C183**	Sampling and the Amount of Testing of Hydraulic Cement
ASTM C184	Test for Fineness of Hydraulic Cement by the No. 100 and No. 200 Sieves
ASTM C186	Heat of Hydration of Hydraulic Cement
ASTM C187	Test for Normal Consistency of Hydraulic Cement
ASTM **C188**	Density of Hydraulic Cement
ASTM **C190**	Tensile Strength of Hydraulic Cement Mortars
ASTM C191	Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C204	Fineness of Portland Cement by Air Permeability Apparatus
ASTM **C206**	Finishing Hydrated Lime
ASTM **C207**	Hydrated Lime for Masonry Purposes
ASTM **C208**	Insulating Board (Cellulosic Fiber), Structural and Decorative
ASTM **C219**	Definitions of Terms Relating to Hydraulic Cement
ASTM C226	Specification for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Portland Cement
ASTM C227	Potential Alkali Reactivity of Cement-Aggregate Combinations
ASTM **C230**	Specification for Flow Table for Use in Tests of Hydraulic Cement
ASTM C233	Air-Entraining Admixtures for Concrete
ASTM C241	Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C243	Test for Bleeding of Cement Pastes and Mortars
ASTM **C260**	Specification for Air-Entraining Admixtures for Concrete
ASTM **C265**	Test for Calcium Sulfate in Hydrated Portland Cement Mortar
ASTM **C266**	Time of Setting of Hydraulic-Cement by Gillmore Needles
ASTM C267	Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings
ASTM **C295**	Petrographic Examination of Aggregates for Concrete
ASTM **C309**	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM **C311**	Sampling and Testing Fly Ash and Raw or Calcined Natural Pozolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM **C330**	Lightweight Aggregates for Structural Concrete
ASTM C332	Lightweight Aggregates for Insulating Concrete
ASTM C423	Test Method for Sound Absorption of Acoustical Materials by Reverberation Room Method

NATIONAL STANDARDS

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM C442	Specification for Gypsum Backing Board and Coreboard
ASTM C465	Specification for Processing Additions for Use in Manufacture of Hydraulic Cements
ASTM C475	Specification for Joint Treatment Materials for Gypsum Wallboard Construction
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM C501	Specification for Marble Building Stone
ASTM C514	Specification for Nails for the Application of Gypsum Wallboard
ASTM C535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C595	Blended Hydraulic Cements
ASTM C552	Cellular Glass Block and Pipe Thermal Insulation
ASTM C557	Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing
ASTM C629	Specification for Slate Building Stone
ASTM C630	Specification for Water-Resistant Gypsum Backing Board
ASTM C635	Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636	Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C645	Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board
ASTM C665	Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C726	Perlite Thermal Insulation Board
ASTM C754	Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board
ASTM C840	Specification for Application and Finishing of Gypsum Board
ASTM C647	Specification for Metal Lath
ASTM C851	Recommended Practice for Estimating Scratch Hardness of Coarse Aggregate Particles
ASTM C919	Practices for Use of Sealants in Acoustical Applications
ASTM C920	Specification for Elastomeric Joint Sealants
ASTM C964	Perlite Board, Rigid Cellular Polyurethane Composite Roof Insulation
ASTM CI002	Specification for Steel Drill Screws for Application of Gypsum Board
ASTM CI050	Rigid Cellular Polyurethane Composite Roof Insulation
ASTM D96	Calcium Chloride
ASTM D1335	Test Method for Tuft Bind of Pile Floor Coverings
ASTM D1779	Specification for Adhesive for Acoustical Materials
ASTM D2859	Test Method for Flammability of Finished Textile Floor Covering Materials
ASTM D3574	Method of Testing Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams
ASTM 04397	Specifications for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM EI 1	Wire Cloth Sieves for Testing Purposes
ASTM E64	Test Method for Surface Burning Characteristics of Building Materials
ASTM EI 19	Method for Fire Tests of Building Construction and Materials
ASTM E263	Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors
ASTM E330	Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

NATIONAL STANDARDS

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM E331	Water Penetratron of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
ASTM **E488**	Test Method for Strength of Anchors in Concrete and Masonry Elements
ASTM **E514**	Water Penetration and Leakage Through Masonry
ASTM **E515**	Leaks Using Bubble Emission Techniques
ASTM E590	Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint
ASTM E648	Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
ASTM E662	Test Method for Specific Optical Density of Smoke Generated by Solid Materials
ASTM E737	Installation of Storm Windows, Replacement Windows, Multi-Glazing, Storm Doors, and Replacement Doors
ASTM E795	Practices for Mounting Test Specimens During Sound Absorption Tests
ASTM El 190	Test Methods for Strength of Powder Actuated Fasteners Installed in Structural Members
ASTM El264	Classification for Acoustical Ceiling Products

AMERICAN ASSOCIATION OF TEXTILE COLORISTS & CHEMISTS (AATCC)

AATCC 30	Anti-Fungal Activity Assessment on Textile Materials; Mildew and Rot Resistance of Textile Materials
AATCC 100	Assessment of Anti-Bacterial Finrshes on Textile Materials
AATCC 134	Electrostatic Propensity of Carpets

AMERICAN WOOD-PRESERVERS ASSOCIATION (AWPA)

AWPA Cl	All Timber Products - Preservative Treatment by Pressure Processes
AWPA **M4**	The Care of Preservative-Treated Wood Products

BRICK INSTITUTE OF AMERICA **(BIA)**

BIA Tech Note 20	Cleaning Brick Masonry

BUILDING OFFICIALS & CODE ADMINISTRATORS INTERNATIONAL (BOCA)

BOCA	The BOCA National Building Code

DOOR & HARDWARE INSTITUTE (DHI)

DHI 02	Installation Guide for Doors and Hardware
DHI 06	Basic Architectural Hardware
DHI Al 15	Steel Door Preparation Standards-Complete Set (Includes Al 15.1 thru A115.7 and A115.12 thru A115.17)
DHI Al 15.7	Preparation for Floor Closers - Light Duty, Center Hung, Single or Double Acting; Center Hung, Single or Double Hung; Offset Hung, Single Acting

NATIONAL STANDARDS

FLAT GLASS MARKETING ASSOCIATION (FGMA)

GA 201	Using Gypsum Board for Walls and Ceilings
GA 216	Recommended Specifications for the Application and Finishing of Gypsum Board
GA 219	Recommendations for Installation of Steel Fire Door Frames in Steel Stud-Gypsum Board Fire-Rated Partitions
GA 220	Special Recommendations - Gypsum Board Winter Related Problems
GA 505	Gypsum Board Products - Glossary of Terminology
GA 600	Fire Resistance Design Manual Eleventh Edition
GA 650	Recommendations for Covering Existing Interior Walls and Ceilings with Gypsum Board

GYPSUM ASSOCIATION (GA)

FGMA 01-90	Glazing Manual

NATIONAL ASSN OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM HMMA 802	Manufacturing of Hollow Metal Doors and Frames
NAAMM HMMA 830	Hollow Metal Manual; Section: Hardware Preparation and Locations for Hollow Metal Doors and Frames
NAAMM HMMA 840	Hollow Metal Manual; Section: Installation and Storage of Hollow Metal Doors and Frames
NAAMM HMMA 861	Hollow Metal Manual; Section: Guide Specifications for Commercial Hollow Metal Doors and Frames
NAAMM HMMA 862	Hollow Metal Manual; Section: Guide Specifications for Commercial Security Hollow Metal Doors and Frames

NATIONAL ASSOCIATION OF GARAGE DOOR MANUFACTURERS (NAGDM)

NAGDM 102	Specifications for Sectional Overhead Type Doors

NATIONAL OAK FLOORING MANUFACTURERS ASSOCIATION (NOFMA)

NOFMA	Hardwood Flooring Installation Manual
NOFMA	Hardwood Flooring Finishing/Refinishing Manual
NOFMA	Behavior of Floors

NATIONAL TERRAZZO & MOSAIC ASSOCIATION, INC. (NTMA)

NTMA	Terrazzo Technical Data
NTMA	Terrazzo Design Data

NATIONAL WOOD WINDOWS & DOOR ASSOCIATION (NWWDA)

NWWDA IS 1	Wood Flush Doors
NWWDA IS 2	Wood Windows
NWWDA IS 4	Water-Repellent Preservative Treatment for Millwork

NATIONAL STANDARDS

PORTLAND CEMENT ASSOCIATION (PCA)

PCA	Specifications for Plain and Reinforced Concrete
PCA	Architectural Concrete Specifications

STEEL DOOR INSTITUTE (SDOI)

SDOI SDI 100	Standard Steel Doors and Frames
SDOI SDI 105	Recommended Erection Instructions for Steel Frames
SDOI SDI 106	Standard Door Type Nomenclature
SDOI SDI 107	Hardware on Steel Doors
SDOI SDI 111	Recommended Standard Details - Steel Doors and Frames

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC PA1	Shop, Field, and Maintenance Painting

UNIFORM BUILDING CODE (UBC)

UBC	The UBC National Building Code

END OF SUBSECTION

INDUSTRY PUBLICATIONS

PUBLICATION	PUBLISHER
ASTM Standards in Building Codes	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
Index of Federal Specifications, Standards and Commercial Item Descriptions	General Services Administration Office of Federal Supply and Services 7th & D Streets, S.W. Washington, DC 20202
UL Building Materials Directory	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062
FM Approval Guide and FM Loss Prevention Data Sheets	Factory Mutual Research Norwood, MA 02062
ACI Detailing Manual and Structural Concrete for Buildings	American Concrete Institute P.O. Box 19150 Detroit, MI 48219-0150
Terminology, Design, Hardware, Engineering Specifications	Aluminum Store Front and Entrance Manual 2700 River Road Des Plaines, IL 60018
Putting Drywall in a More Critical Light, 1987	USG Interiors, Inc. 101 South Wacker Drive Chicago, IL 60606
Terrazzo Design Data	National Terrazzo and Mosaic Association, Inc. 3166 Des Plaines Ave, Suite 132 Des Plaines, IL 60018
Handbook for Ceramic Tile Installation	Tile Council of America 10233 Sandyville Rd., SE. East Sparta, OH 44626

INDUSTRY PUBLICATIONS

END OF SUBSECTION

OTHER RELATED REFERENCES

1989 Handbook for Ceramic Tile Installation. Princeton, 1988

American Institute of Architect Masterspec; Washington, D.C.

ADAMS, J.T. 1983. The Complete Concrete, Masonry and Brick Handbook. New York, NY: Van Nostrand Co.

Carpet Specifier's Handbook and Flammability of Carpets, 1987. Carpet and Rug Institute

Ceramic Tile Manual, 2nd Ed. Los Angeles: Building News, Inc., 1986.

Good Painting Practice; Steel Structures Painting Manual, Volume 1 and 2. Pittsburgh, PA. SSPC, Steel Structures Painting Council.

Hardwood Flooring: The Wood Book, 1990. Wood & Synthetic Flooring Institute. Montgomery, AL.

KAISER, Harvey H. PhD. 1989. The Facilities Manager's Reference. Kingston, MA: R.S. Means Company, Inc.

LISKA, Roger W. 1988. Means Facilities Maintenance Standards. Kingston, MA: R.S. Means Company, Inc.

Maintenance of Vinyl Composition (With or Without Asbestos) and Asphalt Floors, 1990. Resilient Floor Institute.

MATULIONIS, Raymond C. and Freitag, Joan C. 1991. Preventive Maintenance of Buildings. New York, NY: Van Nostrand Reinhold.

Means Facilities Cost Data. Kingston, MA: R.S. Means Company, Inc.

Means Graphic Construction Standards, 1986. Kingston, MA: R.S. Means Company, Inc.

SACK, Thomas F. 1971. A Complete Guide to Building and Plant Maintenance. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Specification for Commercial Interiors. Whitney Library of Design, 1989.

Time-Saver Standards. McGraw-Hill, New York, NY.

Wood & Synthetic Flooring Specifications, Details. Wood & Synthetic Flooring Institute. Montgomery, AL.

Magazine Articles:

Annual Checkups Maintain Crack Repairs. Parking Technology. July, 1991.

Details Underfoot. Architectural Record. July 1988. pp. 118-121.

The Performance of Portland Cement. ASTM Standardization News. January, 1992.

OTHER RELATED REFERENCES

END OF SUBSECTION

APPENDIX A

ABBREVIATIONS

A, Amp	Ampere, Area
A/E	Architect-Engineer
AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Boiler Manufacturers Association
ABS	Acrylonitrile-Butadiene-Styrene
AC	Alternating Current, Air Conditioning
ACFM	Actual Cubic Feet per Minute
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
ACSM	American Congress on Surveying and Mapping
ADF	Asset Determinant Factor
ADJ	Adjustable
ADM	Action Description Memorandum
ADP	Automated Data Processing
AEC	U.S. Atomic Energy Commission
AFM	U.S. Air Force Manual
AFR	U.S. Air Force Regulation
AFWL	U.S. Air Force Weapons
AGA	American Gas Association
AHU	Air Handling Unit
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALARA	As Low as Reasonably Achievable
Allow	Allowance
Amb	Ambient
AMC	U.S. Army Materiel Command
AMCA	Air Movement Contractors Association
AMC-R	Army Materiel Command Regulation
Amp	Ampere
ANS	American Nuclear Society
ANSI	American National Standards Institute
API	American Petroleum Institute
Approx.	Approximately
AR	U.S. Army Regulation
AREA	American Railway Engineering Association
ARI	American Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASBC	American Standard Building Code
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration & Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATM	Atmosphere
AVG	Average
AVLIS	Atomic Vapor Laser Isotope Separation
AWG	American Wire Gauge
AWS	American Welding Society

APPENDIX A

AWWA	American Water Works Association
BAT	Best Available Technology
BATEA	Best Available Technology Economically Achievable
BCPCT	Best Conventional Pollutant Control Technology
BESEP	Base Electronic System Engineering Plan
BHP	Brake Horsepower
BI	Black Iron
BIA	Brick Institute of America
BIL	Basic Impulse Insulation Level
BKRS	Breakers
BLDG	Building
BOCA	Building Official Code Association
BOD	Biochemical Oxygen Demand
	Building Research Advisory Board (now Building Research Board)
BRB	Building Research Board
BRG	Bearing
BTU	British Thermal Unit
°C	Degrees Centigrade (Celsius)
C&GS	U.S. Coast and Geodetic Survey (now National Geodetic Survey)
C M	Clean Air Act
CAMS	Continuous Air Monitoring System
CAS	Condition Assessment Survey
CCTV	Closed Circuit Television
CDR	Conceptual Design Report
CEM	Continuous Emissions Monitoring
CERC	U.S. Army Coastal Engineering Research Center
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CF	Cubic Feet
CFC	Chlorofluorocarbon
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CHW	Chilled Water
CI	Cast Iron
CIP	Cast-in-Place, Cast Iron Pipe
CISCA	Ceiling and Interior Systems Contractors Association
CISPI	Cast Iron Soil Pipe Institute
CMP	Corrugated Metal Pipe
CO_2	Carbon Dioxide
COE	U.S. Army Corps of Engineers
COMPR	Compressor
COP	Coefficient of Performance
CP	Concrete Pipe
CPLG	Coupling
CPSC	Consumer Product Safety Commission
CPVC	Chlorinated Polyvinyl Chloride
CRI	Carpet and Rug Institute
CRT	Cathode Ray Tube
C_v	Flow coefficient
c w	Cold Water
CWA	Clean Water Act
CYL	Cylinder

APPENDIX A

DAC	Derived Air Concentration
DARCOM	U.S. Army Development, Acquisition and Readiness Command
DB	Dry Bulb, Decibel
DBA	Design Basis Accident
'DBE	Design Basis Earthquake
DBF	Design Basis Fire
DBFL	Design Basis Flood
DBG	Distance Between Guides
DBT	Design Basis Tornado
DBW	Design Basis Wind
DC	Direct Current
DCG	Derived Concentration Guide
DCPA	Defense Civil Preparedness Agency
DL	Dead Load
DM	NAVFAC Design Manual
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOP	Dioctylphthalate
DOT	U.S. Department of Transportation
DP	Differential Pressure
DP-1	Assistant Secretary for Defense Programs
DP-34	Director of Safeguards and Security Agreement
DPDT	Double-Pole Double-Throw
DSC	Differential Scanning Calorimetry
DTA	Differential Thermal Analysis
DWT	Double Wrap Traction
DWV	Drain, Waste & Vent
DX	Direct Expansion
DYN	Dyne
EA	Each
ECC	Emergency Control Center
ECP	Entry Control Point
EMCS	Energy Monitoring and Control System
ECS	Emergency Control Station
EDE	Effective Dose Equivalent
EED	Electroexplosive Device
EIA	Electronics Industries Association
EIFS	Exterior Insulation and Finish System
EIMA	Exterior Insulation Manufacturers Association
EIS	Environmental Impact Statement
Elev	Elevator
EM	U.S. Army Engineering Manual
EMS	Energy Management System
EMT	Electrical Metallic Tubing
EO	Executive Order
EOC	Emergency Operating Center
EPA	U.S. Environmental Protection Agency
EPS	Emergency Power System
Equ ip	Equipment
ERDA	Energy Research and Development Administration (precursor to DOE)
ESF	Engineered Safety Feature
Est	Estimated

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Ext	Exterior
°F	Degrees Fahrenheit
F M	Federal Aviation Administration
FAI	Fauske and Associates, Inc.
FAR	Federal Acquisition Regulation
FCC	Federal Construction Council
FEMA	Federal Emergency Management Agency
FGA	Flat Glass Marketing Association
FGCC	Federal Geodetic Control Committee
FGD	Flue Gas Desulphurization
FHWA	Federal Highway Administration
FHDA	Fir and Hemlock Door Association
Flg	Figure
FIPS	Federal information Processing Standards
Flxt	Fixture
Flr	Floor
FM	Factory Mutual
Fndtn	Foundation
FPM	Feet Per Minute
FPT	Female Pipe Thread
FR	Federal Register
fr	Frame
FS	Federal Specifications
FSAR	Final Safety Analysis Report
Ft	Foot, feet
Ft/lb	Foot-Pound
FWPCA	Federal Water Pollution Control Act
fy	Yield strength
G	Gauss
g	Gram
GA	Gypsum Association
ga	Gauge
Gal	Gallon
Galv	Galvanized
GDC	General Design Criteria, DOE 6430.1A
GPD	Gallon Per Day
GPH	Gallon Per Hour
GPM	Gallons Per Minute
GSA	General Services Administration
HE	High Explosives
HE-Pu	High Explosives-Plutonium
HF	High Frequency, Hydrogen Fluoride
HI	Hydraulic Institute
HID	High Intensity Discharge
HLW	High-Level Waste
HOA	Hand-Off-Automatic
HP	Horsepower
HR	Hour
Htg	Heating
Htr	Heater
HTW	High Temperature Water
HVAC	Heating, Ventilating, and Air-Conditioning

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Hvy	Heavy
HW	Hot Water
Hyd	Hydraulic
HX	Heat Exchanger
HZ	Hertz, frequency
IAPMO	International Association of Plumbing and Mechanical Officials
IAS	Intrusion Alarm System
ICBO	International Conference of Building Officials
ICRP	International Commission on Radiological Protection
ID	Inside Diameter
IDA	Intrusion Detection and Assessment
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronic Engineers
IES	Illumination Engineering Society
IFM	Irradiated Fissile Material
IFMSF	Irradiated Fissile Material Storage Facility
IHE	Insensitive High Explosives
IMC	Intermediate Metal Conduit
In	Inch
Incl	Installed, Including
Inst	Installation
Insul	Insullation
IP	Iron Pipe
IPS	Iron Pipe Size
IPT	Iron Pipe Threaded
ISDSI	Insulated Steel Door Systems Institute
IU	Inspection Unit
IUEC	International Union of Elevator Contractors
J	Joule
°K	Degrees Kelvin
K	Subgrade modulus, Thousand, heavy wall copper tubing
Kg	Kilogram
kHz	Kilohertz
Kip	1000 pounds
Km	Kilometer
kPa	kilo Pascal
KV	Kilovolt
kVA	kiloVolt Ampere
kW	kilowatt
kWh	kilowatt hour
lb	Pound
lb/hr	Pounds Per Hour
lbf	Pounds Per Foot
LCC	Life-Cycle Cost
LCD	Liquid Crystal Display
LF	Linear Feet
LL	Live load psf - pounds per square foot
LLW	Low-Level Waste
LP	Liquid Petroleum, Low Pressure
LPG	Liquified Petroleum Gas
Lt	tight
LV	Low Voltage

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MA	Management and Administration (U.S. DOE)
mA	milliAmpre
M M	Material Access Area
Mach	Machine
Maint	Maintenance
MAWP	Maximum Allowable Working Pressure
MBA	Material Balance Area
MBH	Thousand BTUs per Hour
MBMA	Metal Building Manufacturers' Association
MC&A	Material Control and Accountability
MCF	Thousand Cubic Feet
Mfg	Manufacturing
Mfr	Manufacturer
MCC	Motor Control Center
mg	Milligram
mg/l	Milligrams per liter
MGPH	Thousand Gallons Per Hour
Mhz	Megahertz
MI	Miles, total level route
MIL-HDBK	U.S. DOD military handbook
MIN	Minute
min	Minimum
Misc	Miscellaneous
ml	Millileter
ML/SFA	Metal Lath/Steel Framing Association
mm	Millimeter
M&O	Management and Operations
MPH	Miles Per Hour
MPT	Male Pipe Thread
mr/h	milli roentgen/hour
mrad/h	milli roentgen, absorbed dose/hour
mrem	milli roentgen equivalent man
MSSA	Master Safeguards and Security Agreement
Mtng	Mounting
MVA	Million-Volt-Amps
$\mathbf{N_2}$	Nitrogen
N/A	Not Applicable
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAD	North American Datum
NAEC	National Association of Elevator Contractors
NAESA	National Association of Elevator Safety Authorities
NAPHCC	National Association of Plumbing-Heating-Cooling Contractors
NASA	National Aeronautics and Space Administration
NAVFAC	Naval Facilities Engineering Command
NBC	National Building Code
NBS	National Bureau of Standards
NC	Noise Criteria
NCEL	Naval Civil Engineering Laboratory (references listed under NAVFAC)
NCMA	National Concrete Masonry Association
NDA	Non-Destructive Assay
NEC	National Electrical Code

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NEII	National Elevator Industry Incorporated
NEMA	National Electrical Manufacturers Association
NEMI	National Elevator Manufacturing Industry, Inc. (now NEII)
NEPA	National Environmental Policy Act
NFGS	Naval Facilities Guide Specification (references listed under NAVFAC)
NFPA	National Fire Protection Association
NGS	National Geodetic Survey (formerly U.S.Coast and Geodetic Survey)
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NIJ	National Institute of Justice
NIST	National Institute of Standards and Technology (see NBS)
NOM	National Oceanic and Atmospheric Administration
NO	Normally Open
NO_x	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NPDWS	National Primary Drinking Water Standards
NPSH	Net Positive Suction Head
NPT	National Pipe Thread
NRC	Nuclear Regulatory Commission
NRCA	National Roofing Contractors Association
NRTA	Near-Real-Time Accountancy
NRTL	Nationally Recognized Testing Laboratory
NSA	National Security Agency
NSPC	National Standard Plumbing Code
NSPS	New Source Performance Standards
NTIA	National Telecommunications and Information Administration
NTMA	National Terrazzo and Mosaic Association
NUREG	Nuclear Regulatory Commission-produced reference document
NWWDA	National Wood Window and Door Association
OA	Outside Air
OBA	Operating Basis Accident
OBE	Operating Basis Earthquake
oc	On Center
ocs	Office of Computer Services (U.S. DOE)
OD	Outside Dimension
ODH	Oxygen Deficiency Hazards
O & M	Operations and Maintenance
OMB	Office of Management and Budget
OP AMP	Operational Amplifier
Oper	Operator
OPFM	Office of Project and Facilities Management (U.S. DOE)
OS&Y	Outside Screw and Yoke
OSHA	Occupational Safety and Health Administration
OSR	Operational Safety Requirement
oss	Office of Safeguards and Security (U.S. DOE)
OSTI	Office of Scientific and Technical Information (U.S. DOE)
OWG	Oil, Water, or Gas
Oz	Ounce
p	Minimum reinforcing ratio
PA	Protected area
PB	Polybutylene
PCB	Polychlorinated biphenyls

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PCI	Prestressed Concrete Institute
PEL	Permissible Exposure Limit
PF	Protection Factor
Ph	Phase
PI	Point of Intersection, Proportional-plus Integral
PIV	Post Indicator Valve
PLF	Pounds per Linear Foot
Pkg	Package
PMFL	Probable Maximum Flood
POL	Petroleum, Oil, and Lubricants
POTW	Publicly-Owned Treatment Works
PPHF	Plutonium Processing and Handling Facility
PPM	Parts Per Million
PRV	Pressure Regulating Valve
PSAR	Preliminary Safety Analysis Report
PSF	Plutonium Storage Facility, Pound-force per square foot
PSI	Pound-force per square inch
PSIA	Pounds per square inch absolute
PSIG	Pound-force per square inch gauge
PTI	Post Tensioning Institute
Pu	Plutonium
PUBN	Publication
PURPA	Public Utility Regulatory Policy Act
PVC	Polyvinyl Chloride
QA	Quality Assurance
Qty	Quantity
R	Resistance
R12, R22	Refigerant (12,22, etc.)
°R	Degrees Rankine
RCP	Reinforced Concrete Pipe
RCRA	Resource Conservation and Recovery Act
RDF	Refuse-Derived Fuel
REM	Roentgen Equivalent Man
Reqd	Required
RFCI	Resilient Floor Covering Institute
RG	Regulatory Guide
RLWF	Radioactive Liquid Waste Facility
RPFM	Real Property and Facilities Management (US. DOE)
RPIS	Real Property Inventory System (U.S. DOE)
RPM	Revolutions Per Minute
RSWF	Radioactive Solid Waste Facility
RTD	Resistance Temperature Detector
S&S	Safeguards and Security
SAR	Safety Analysis Report
SARS	Safety Analysis and Review System
SAS	Secondary Alarm Station
SC	Safety Class
SCFM	Standard Cubic Feet per Minute
SCR	Sillicon Control Rectifier
SCS	U.S. Department of Agriculture, Soil Conservation Service
SDI	Steel Deck Institute, Steel Door Institute
SDWA	Safe Drinking Water Act

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SF	Safety Factor
SOFT	Structural Glazed Facing Tile
SISL	Special Isotope Separation Laser
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SNG	Supplementary Natural Gas
SNM	Special Nuclear Materials
SO_2	Sulfur dioxide
SOP	Standard Operating Procedure
SP	Special Publication (of the American Concrete Association)
SPCC	Spill Prevention Control and Countermeasure
SPDT	Single-Pole Double-Throw
SPRI	Single Ply Roofing Institute
SPST	Single-Pole Single-Throw
ssco	Single Speed Center-Opening
SQFT	Square foot
SSE	Safe Shutdown Earthquake
SSFI	Scaffolding, Shoring, and Framing Institute
SSSP	Site Safeguards and Security Plan
SSPC	Steel Structures Painting Council.
SSSS	Single Speed Side-Sliding
STC	Sound Transmission Classification
Std	Standard
STP	Standard Temperature and Pressure
Sys	System
SWI	Steel Window Institute
SWP	Safe Working Pressure
SWT	Single Wrap Traction
T	Ton, Temperature
TCA	Tile Council of America, Inc.
TCDD	Tetrachlorodibenzo-p-dioxin
TDS	Total Dissolved Solids
TEC	Total Estimated Cost
TID	Tamper Indicating Device
TIMA	Thermal Insulation Manufacturers Association
TLV	Threshold Limit Value
TM	U.S. Army technical manual
tot	Total
TR	DOD technical report
Transf	Transformer
TRU	Transuranic
TSCA	Toxic Substances Control Act
TSD	Treatment, Storage and Disposal
Tstat	Thermostat
Typ	Typical
N	Television
U value	Overall heat transfer coefficient value
UBC	Uniform Building Code
UCRF	Uranium Conversion and Recovery Facility
UEF	Uranium Enrichment Facility
UEU	Unirradiated Enriched Uranium

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UEUSF	Unirradiated Enriched Uranium Storage Facility
UF_4	Uranium tetrafluoride
UF_6	Uranium hexafluoride
UFAS	Uniform Federal Accessibility Standards
UHF	Ultra High Frequency
UL	Underwriters Laboratory
UMC	Uniform Mechanical Code
UO_2	Uranium dioxide
UO_3	Uranium trioxide
UPA	Unit Process Area
UPC	Uniform Plumbing Code
UPHF	Uranium Processing and Handling Facility
UPS	Uninterruptible Power Supply
URF	Uranium Recovery Facility
USC	U.S. Code
USCE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
USPHS	U.S. Public Health Service
USPS	U.S. Postal Service
V	Volt
VA	Volt-Ampere
Vac	Vacuum
VAV	Variable Air Volume
VCT	Vinyl Composition Floor Tile
Vel	Velocity
Vent	Ventilating
VHF	Very High Frequency
Vol	Volume
W	Watt
WB	Wet Bulb
WBT	Wet Bulb Temperature
WC	Water Column
WG	Water Gauge
WB	Wet Bulb
WBS	Work Breakdown Structure
WPCF	Water Pollution Control Federation
WRC	Water Resources Council
Yd	Yard
Yr	Year

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SYMBOLS

°R'	Degrees Rankine
°K	Degrees Kelvin
°F	Degrees Fahrenheit
°C	Degrees Centigrade (Celcius)
>	Greater Than
<	Less Than
≥	Greater Than or Equal To
≤	Less Than or Equal To
%	Percent
#	Pound, Number
α, A	Alpha
β, B	Beta
ϕ, Φ	Theta
λ, Λ	Lambda
μ, M	Mu
π, Π	Pi
σ, Σ	Sigma
ω, Ω	Omega

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END OF SUBSECTION

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GLOSSARY

Abrasion Resistance:	The ability of a coating to resist degradation due to mechanical wear.
Abrasive Media:	The material used in abrasive blasting to remove surface contaminants. Examples of abrasive media are sand, iron shot, crushed iron slag, glass beads, or ground nut shells.
Absorption (of **Brick):**	Obtained by immersion in either cold or boiling water for stated periods of time. It is usually expressed as a percent of the dry brick weight.
Acrylic Latex:	An aqueous dispersion of acrylic resins.
Acrylic **Resin:**	A clear resin attained by polymerizing various acrylic monomers either alone or in combination.
Activator:	The curing agent of a two component coating system.
Additive:	A substance added to a material to modify or enhance its characteristics.
Adhesion:	The degree of attachment between a paint film and it's underlying material.
Admixture:	Act of mixing or the compound formed by mixing different substances together.
Adobe **Brick:**	A large clay brick, of varying size, roughly molded and sun dried. In certain sections of this country, a brick approximating paving brick size is known by this term.
Adsorption:	Process of attraction or attachment to a surface. The retention of foreign molecules on the surface of a substance.
Aggregates:	Inert minerals such as sand, gravel, and crushed stone. The aggregates are divided into two sizes - fine and coarse.
Air Cap (Air **Nozzle):**	Perforated housing for directing the atomizing air through the head of an air spray gun.
Air Drying:	The most common form of curing a coating in which drying takes place by oxidation or solvent evaporation by simple exposure to air without heat or catalyst.
Air Entrapment:	The inclusion of air bubbles in liquid paint or a paint film.
Airless Spray:	A spraying system in which paint is atomized using high hydraulic pressure rather than compressed air.
Alcohols:	A group of solvents of relatively high evaporation rate but with fairly low solvent strength. Methanol, ethanol, and isopropyl are common alcohols.
Aliphatic Hydrocarbons:	A class of organic solvents composed of open chains of carbon atoms. Aliphatics are relatively weak solvents. Mineral spirits and VM & P Naphtha are aliphatic solvents.
Alkali:	An aqueous liquid that has a pH value of between 7 and 14. A base or caustic material.

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Alkyd Rosin:	Resins prepared by reacting alcohols and fatty acids. Widely used in general purpose coatings.
Alligatoring:	Surface imperfections of a coating film having the wrinkled appearance of alligator skin.
Ambient Tempemture:	Room temperature or the existing temperature of the surroundings.
Amine:	Materials often used as curing agents for epoxy coatings.
Anchor Bolts:	Bolts to secure a wooden sill plate to a concrete or masonry floor or wall. A threaded bolt, usually embedded in a foundation or footing to secure a column base.
Anchor Pattern:	The surface profile generated by abrasive blasting. The distance between peaks and valleys of the blast profile.
Anchor:	A piece or connected pieces of metal used for tying together two or more pieces of masonry materials.
Arch:	A curved structural member used to span an opening or recess; also built flat. Structurally, an arch is a piece or assemblage of pieces so arranged over an opening that the supported load is resolved into pressures on the side supports, and practically normal to their faces.
Aromatic Hydrocarbons:	A class of relatively strong organic solvents that contain an unsaturated ring of carbon atoms. Examples are benzene, toluene, and xylene.
Arris:	A sharp edge forming an external corner at the junction of two surfaces.
Ashlar:	A flat faced surface generally square or rectangular having sawed or dressed beds and joints.
	Coursed Ashlar: Ashlar set to form continuous horizontal joints,
	Stacked Ashlar: Ashlar set to form continuous vertical joints.
	Random Ashlar: Ashlar set with stones of varying length and height so that neither vertical nor horizontal joints are continuous.
Asphalt:	Black resinous material of petroleum origin.
Barge Course:	A course of brick, forming the coping of a wall, set on edge and transversely to the wall.
Barrier Coat:	A coating used to isolate a paint system either from the surface it is applied to or a previous coating for the purpose of increasing adhesion or ensuring compatibility.
Base:	The lowest part, or the lowest main division, of a building, column, pier, or wall.
Base Coune:	The lowest course of masonry of a wall or pier. A footing course.

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Base Plate:	See Bearing Plate.
Bat:	A piece of broken brick.
Beam:	A structural member transversely supporting a load.
Bearing:	That part of a lintel, beam, girder, or truss that rests on a column, pier, or wall.
Bearing Partition:	A partition that supports any vertical load in addition to its own weight.
Bearing Plate:	A piece of steel, iron, or other material that receives the load concentration and transmits it to the masonry or concrete.
Bearing Wall:	A wall that supports any vertical load in addition to its own weight.
Bed:	The prepared soil, or layer of mortar, on or in which a piece of masonry material is laid.
Bed Joint:	A horizontal joint between stones, usually filled with mortar, lead, or sealant.
Belt Course:	Same as a string course.
Bevel:	The angle that one surface or line makes with another, when they are not at right angles.
Binder:	The nonvolatile portion of the coating vehicle that holds the pigment particles together.
Bituminous Coating:	A coal tar or asphalt based coating material usually used in thick films,
Blank Wall:	One having no door, window, or other opening.
Blast Cleaning:	The cleaning and roughing of a surface by the use of sand, artificial grit, or fine metal shot projected at a surface by compressed air or mechanical means.
Blast **Profile:**	Same as anchor pattern. A cross sectional view of an abrasive blasted surface.
Bleaching:	The fading of a color toward white generally caused by exposure to chemicals or ultraviolet radiation.
Bleeding:	The diffusion of color matter through a coating from underlying surfaces causing a color change.
Blistering:	The formation of blisters in paint films by the local loss of adhesion and lifting of the film from the underlying substrate.
Block:	A unit in terra cotta or cement block, differing from a brick in being larger and hollow or solid.
Block (Hollow):	A shape made of clay, terra cotta, or other material fashioned with one or more openings in its body for lightness, whose net sectional area does not exceed 75 percent of its gross sectional area.

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Blocking:	A method of bonding two adjoining or intersecting walls, not built at the same time, by means of offsets and overhanging blocks consisting of several courses of brick each.
Blooming:	A haziness that develops on paint surfaces caused by the exudation of a paint film component.
Blushing:	A film defect that manifests itself as a milky appearance generally caused by rapid solvent evaporation or the presence of excessive moisture during the curing process.
Bond:	The tying or bonding of the various pieces and parts of a masonry wall, by laying one piece across two or more pieces; the entire system of bonding or breaking joints as used in masonry construction. The mortar between brick is sometimes termed a bond.
Bond (Course):	The header course
Bond **Beam:**	A horizontally reinforced concrete or concrete masonry beam built to strengthen and tie a masonry wall together. A bond beam is often placed at the top of a masonry wall with continuous reinforcing around the entire perimeter.
Bond **Stone:**	Stones projecting laterally into the backup wall used to tie the wall together.
Bonding:	The attachment between a coating film and it's underlying material.
Bounce Back:	The rebound of atomized paint, especially when applied by conventional air spray methods.
Boxing:	Mixing of coatings by pouring from one container to another.
Brick:	A structural unit of burnt clay or shale, formed while plastic into a rectangular prism, usually solid, the net sectional area of which is not less than 75 percent of the gross sectional area.
Brick and **Brick:**	A method of laying brick whereby the brick are laid touching each other with only mortar enough to fill the surface irregularities.
Brick Veneer:	A facing of brick laid against and fastened to sheathing of a frame wall of tile wall construction.
Brickwork:	Any structure or structural part, made of brick and mortar.
Brldglng:	The formation of a paint film over a depression.
Brittleness:	A paint film's lack of resistance to cracking or breaking when bent or flexed.
Brushability:	The ease of applying a coating by brush.
Bubbling:	A temporary or permanent film defect in which bubbles of air or solvent vapor are present in the applied film,
Bugged Flnlsh:	A smooth finish produced by grinding with power sanders,
Build:	The wet or dry thickness of a coating film.

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Bull Nose:	Convex rounding of a member, such as the front edge of a stair tread or window sill.
Bull-Header:	A rowlok brick laid with its longest dimension perpendicular to the face of the wall.
Bull-Stretcher:	A rowlok brick laid with its longest dimension parallel to the face of the wall.
Buttering:	Placing mortar on a brick with a trowel before brick is laid.
Buttress:	A piece of masonry, like a pier, built against and bonded into a wall to strengthen the wall against side thrust.
Buttress (Flying):	A detached buttress or pier of masonry, at some distance from the wall, and connected by an arch or arch portion to assist in resisting side thrust.
C/B Ratio:	The ratio of the weight of water absorbed by cold immersion (usually 24 hours) to the weight absorbed by immersion in boiling water (usually 5 hours). This ratio is also known as the saturation coefficient.
Calcite Streak	Description of a white or milky streak occurring in stone. It is a joint plane usually wider than a glass seam that has been recemented by deposition of calcite in the crack. It is structurally sound.
Camber:	A slight upward curve of a structural member so that it becomes horizontal, or nearly so, when loaded.
Cap:	The upper member of a column, pilaster, pile, caisson molding, and the like.
Capital:	Column cap.
Catalyst:	An accelerator, activator, or curing agent that chemically increases the rate of reaction in a coating.
Cathode:	The negative terminal of an electrolytic cell that is protected and not attacked in the corrosion process.
Cathodic **Protection:**	The reduction or prevention of corrosion of a metal surface caused by making it cathodic. This is accomplished by using a sacrificial anode (such as in zinc-rich coatings or galvanizing) or by using impressed current.
Caulklng:	The operation or method of rendering a joint tight against water by means of some plastic substances such as oakum, pitch, elastic cement, and the like.
Caustic:	A strong base or alkaline material.
Caustic Soda:	A common name for sodium hydroxide, a strong base or alkali.
Cellosolve:	Proprietary name for ethylene glycol monoethyl ether. A slow evaporating, water miscible, relatively strong solvent often used in epoxy coatings.
Cementitious Coatings:	A coating containing Portland cement as one of its components held on the surface by a binder.

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Centipoise:	One hundredth of a poise which is a unit of measurement for viscosity. Water at room temperature has a viscosity of 1.0 centipoise.
Ceramic:	Items made of clay or similar materials baked in a kiln to a permanent hardness. Products include pottery, tiles, stoneware, etc.
Ceramic Mosaic Tile:	Small, unglazed tiles commonly used for flooring and walls. Patterns of various colors and shapes are placed on sheets for ease in laying.
Chalking:	The formation of a friable powdery coating on a paint film's surface, generally caused by exposure to ultraviolet radiation resulting in a loss of gloss.
Chat Sawed:	Description of a textured stone finish, obtained by using chat sand in the gang sawing process,
Check Cracks:	Shrinkage cracks in concrete still bonded to its base.
Checking:	Cracks in the surface of a paint film.
Chip Cracks:	Similar to check cracks, except that the bond has been partially destroyed, causing eggshelling. Sometimes referred to as fire cracks, map cracks, crazing, fire checks, or hair cracks.
Chlorinated Hydrocarbon:	A class of strong, fast evaporating, nonflammable solvents such as carbon tetrochloride, methylene chloride, or trichloroethylene.
Chlorinated Rubber:	A coating resin formed by the reaction of rubber with chlorine gas. Often used for chemical or water resistant properties.
Cleaners:	A detergent, alkali, acid, or similar contamination removing material that is usually water borne.
Coal Tar:	A dark brown to black bituminous material produced by the destructive distillation of coal.
Coal Tar Epoxy:	A coating in which the binder or vehicle is a combination of coal tar and epoxy resins.
Coalescence:	The formation of resinous or polymeric material when water evaporates from an emulsion or a latex system, permitting contact and fusion of adjacent particles.
Coat:	The paint applied to a surface in a single application to form a film when dry.
Coating System:	A number of coats separately applied, in a predetermined order,. at suitable intervals to allow for drying and curing, resulting in a completed job.
Cobwebblng:	Premature drying of a coating during spraying causing a spider web effect.
Cohesion:	The forces that bind the particles of a paint film together into a continuous film.

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Cold Rolled Steel:	Low carbon, cold-reduced, sheet steel. Differs from hot rolled steel by the absence of mill scale.
Color Fast:	Nonfading.
Color Retention:	The ability to retain its original color during weathering or chemical exposure.
Column:	A pillar or pier of rather slender proportions that carries a load and acts as an upright support.
Combustible Liquid:	Any liquid having a flash point at or above 100°F (37.8°C).
Compatibility:	The ability to mix with or adhere properly to other coatings without detriment.
Conical Mandrel:	An instrument used to evaluate a coating's 'resistance to cracking when bent over a specified radius.
Connectors:	A device that holds two or more structural members intact.
Construction Joint:	The interface/meeting surface between two successive concrete pours.
Coping:	The material or member used to form a capping or finish on top of a wall, pier, or the like, to protect the masonry below by throwing off the water to one or more sides.
Copolymer:	Large molecules obtained by simultaneous polymerization of different monomers, as in vinyl copolymers.
Corbel:	That part of the masonry built outward from the face of masonry by projecting successive courses of the masonry.
Corbel Out:	To build out one or more courses of brick or stone from the face of a wall to form a support for timbers.
Cork Tile:	Tiles made from cork particles bound and pressed into sheets and covered with a protective wearing finish.
Cornice:	A molded projecting stone at the top of an entablature,
Corrosion:	The decay, oxidation, or deterioration of a substance due to interaction with the environment.
Course:	One of the continuous horizontal layers (or rows) of masonry units that when bonded together form a masonry structure.
Cracking:	Splitting of a paint film usually as a result of aging.
Cramp:	An anchor for masonry, made of a short, flat bar of metal, with both ends turned down at right angles, used for tying the masonry together by bedding the bent ends in holes provided in the masonry units.
Craters:	The formation of small bowl shape depressions in paint films.
cmp:	The time-dependent deformation of steel or concrete due to sustained load.
Cross Spnylng:	Spraying the first pass in one direction and the second at a right angle to the first, providing more even film distribution.

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Crosslinking:	The setting up of chemical links between molecular chains to form a three dimensional network of connected molecules.
Crowfoot:	(Stylolite.) A dark gray to black zig-zag marking occurring in stone. Usually structurally sound.
crown:	The top or high point of a horizontal surface.
Curing Agent:	A hardener or activator added to a synthetic resin to develop the proper film forming properties.
Curtains:	Long horizontal runs in a coating film that occur on vertical surfaces when a coating is applied too heavily.
Cut Stone:	Finished, dimensioned stone, ready to set in place.
Cutting:	Handwork required to finish a stone that cannot be done by machine.
Damp **Course:**	A course or layer of impervious material in a wall or floor to prevent the entrance of moisture from the ground or from a lower course.
Deformed Bars:	(1) Reinforcing bars with closely spaced shoulders, lugs, or projections formed integrally with the bar during rolling so as to firmly engage the surrounding mortar. (2) Wire mesh with welded intersections not farther apart than 12 inches (30 cm.) in the direction of the principal reinforcement and with cross wires not smaller than No. 10. May be rated as a deformed bar.
Degreaser:	A chemical solution or compound designed to remove grease, oils, and similar contaminants.
Deionized Water:	Water that has been purified to remove mineral salts.
Delamination:	The separation between layers of coats due to very poor adhesion.
Density:	Mass per unit volume, usually expressed as grams per milliliter or pounds per gallon.
Dentil:	Block projections on an entablature.
Dentil Course:	Mold course immediately below the cornice, having on one of its members small uniformly spaced blocks, referred to as dentils.
Descaling:	The removal of mill scale or rust from steel by mechanical means, sometimes assisted by flame cleaning.
Dew Point:	The temperature of a surface, at a given ambient temperature and relative humidity, at which condensation of moisture will occur.
DFT:	Dry film thickness.
Diamond Sawed:	Finish produced by sawing with diamond toothed saws (either circular or gang).
Diluent:	A portion of a coating's volatile components that is not a true solvent and has minimal affect on the viscosity.

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Dimensioned Stone:	Stone precut and shaped to specified sizes.
Dispersion:	The suspension of tiny particles, usually pigments, in a liquid, usually resin.
Distilled Water:	Water that has been purified by vaporizing the liquid and collecting the vapor which is then condensed back to a liquid having removed all salts, metals, etc. in the process.
Dope:	Term used for additives used either to accelerate or retard the set of any type of mortar.
Drip:	Any projecting piece of material, member, 'or part of a member so shaped and placed as to throw off water and prevent its running down the face of a wall or other surface of which it is a part.
Dry Fail:	A coating designed to dry rapidly so the overspray can be easily removed from the surfaces below.
Dry Seam:	Unhealed fracture that is a plane of weakness.
Dry Spray:	Overspray or bounce back producing a sandy finish due to the sprayed particles having partially dried before reaching the surface.
Dry Time:	Time allotted for an applied coating film to reach a set stage of cure or hardness.
Dry-Out:	Soft, chalky mortar caused by water evaporating before setting.
Dry-to-Handle:	The degree of cure at which a film will resist deformation due to handling.
Dry-to-Recoat:	The time required for a cured film to dry prior to the application of a second coat.
Dry-to-Tack **Free:**	A stage at which a coating film will form a skin dust will not adhere to.
Dry-to-Touch:	The state of dry at which a coating film will not transfer onto an item touched lightly against it.
Dryer:	A chemical that promotes oxidation and subsequent drying of a paint film. Primarily used in oil base paints,
Dying Oil:	An oil having the property of hardening by oxidation to a tough film when exposed to air in the form of a thin film.
Drywall:	The term commonly applied to interior finish construction using preformed sheets, such as gypsum wallboard, as opposed to using plaster.
Dulling:	A loss of gloss or sheen.
Dusting:	The development of dust on the surface of concrete. Dusting can be the result of trowelling too soon, too much water in the mix, improper mix design, or other reasons.

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Effective Area of Brick Masonry: The area of a section that lies between the centroid of the tensile reinforcement and the compression face of the structural member.

Effective Area of Reinforcement: The area obtained by multiplying the right cross-sectional area of the metal reinforcement by the cosine of the angle between its direction and that for which the effectiveness of the reinforcement is to be determined.

Eff ettive Depth: The distance from the center of gravity of tensile reinforcement to the compression surface of a structural member.

Effervescence: An effect in the film caused by rapid solvent release. This "boiling" of solvent causes a pinholed or cratered appearance reducing gloss.

Eff iorescence: Mortars or cements that contain an excess of soluble salts will contribute to masonry efflorescence. Efflorescence can only occur when water penetrates the masonry or concrete, dissolves the salts, and upon evaporation deposits them on the wall face. The surest preventative of efflorescence is to keep water out of masonry or concrete.

Eggshelling: Refers to the condition of chip-cracked concrete, mortar, or plaster. The form taken is concave to the surface and the bond is partially destroyed.

Elastic: The ability of a substance to return to its original shape or volume after a distorting force on the substance has been removed.

Eicometer: A trademark and brand name for a magnetic instrument for measuring dry film thicknesses of coatings applied to ferrous surfaces such as steel.

Electrical Potential: A minute voltage produced by the separation of molecules into their ionic state.

Eiectroiyte: A substance that dissociates into ions in solution thereby becoming electrically conductive.

Electromotive Series: A listing of elements arranged according to their standard electrical potentials otherwise known as galvanic series.

Eiectrortatic Spray: The spray application of paint where the particles are charged causing them to be electrically attracted to the grounded surface.

Emulsion: A two phase liquid system in which small droplets of one liquid are immiscible in and dispersed uniformly throughout a second continuous liquid phase.

Enamel: A term used to characterize a coating which has a glossy smooth finish. A common term for alkyd coatings.

Enclosure Wail: An exterior non-bearing wall in skeleton construction, anchored to columns, piers, or floors, but not necessarily built between columns or piers nor wholly supported at each story.

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Entablature:	Consists of an architrave, frieze, and cornice.
Entasis:	The curve resulting from the gradual diminishing of the diameter of the upper two-thirds of a column.
Epoxy:	A synthetic resin, derived from petroleum products, that can be cured by a catalyst or used to upgrade other synthetic resins to form a harder, more chemical resistant film.
Epoxy Resin:	A flexible, usually thermal setting resin made by polymerization of an epoxide and used as an adhesive.
Etching:	The treatment of a surface with an acid in order to dissolve loose particles or provide a profile.
Expanded Metal:	Sheets of metal that are slit and drawn out to form diamond-shaped openings. This is used as a metal reinforcing for plaster and is termed ***metal*** *lath.*
Expansion Anchor:	A metal, expandable unit inserted into a drilled hole that grips stone by expansion.
Expansion Joint:	A bituminous fiber strip used to separate blocks or units of concrete to prevent cracking due to expansion as a result of temperature changes. Also used in concrete slabs.
External Atomization:	Using air to break up a coating material after it has exited the spray gun nozzle.
Face:	The front or exposed surface of a wall.
Facing:	Any material forming a part of the wall used on the exterior as a finishing surface.
Fading:	Loss of gloss or sheen.
Fan Pattern:	The geometry of a spray pattern.
Fat:	Material accumulated on the trowel during the finishing operation and used to fill in small imperfections. Also a term to describe working characteristics of any type mortar.
Feather Edge:	Reduced film thickness at the edge of a dry paint film in order to produce a smooth, continuous appearance.
Filler:	A compound used to extend or bulk a coating to provide extra body or hiding power.
Film Build:	The dry film thickness characteristics of a coat.
Film Integrity:	The continuity of a coating free of defects,
Film Thickness Gauge:	A device for measuring either wet or dry film thickness.
Film:	A layer of coating or paint.
Fineness of **Grind:**	The degree of dispersion of particles within a liquid.
Rngerlng:	A broken spray pattern delivering heavier paint to one area than another.
Fire Division Wall:	Any wall that subdivides a building to resist the spread of fire, but is not necessarily continuous through all stories to and above the roof.

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Fire Resistance: The property of a material or assembly to withstand fire, characterized by the ability to confine a fire and/or to continue to perform a given structural function.

Fire stop: Any piece or mass of fire resistant material used for filling in open spaces or close openings in order to prevent the passage of fire.

Fire Wall: Any wall that subdivides a building to resist the spread of fire, by starting at the foundation and extending continuously through all stories to and above the roof.

Fireproofing: Any material or combination of materials used to enclose structural members to make them fire resistant.

Flammable: Any substance easily ignited in the presence of a flame; any liquid having a flash point below 100°F (37.8°C).

Flash Point: The lowest temperature of a liquid at which sufficient vapor is provided to form an ignitable mixture when mixed with air.

Flash-Off Time: Time that must be allowed after the application of a paint film before baking allowing the release of initial solvents to prevent bubbling.

Flashing: The material used and the process of making watertight the roof intersections and other exposed places dn the outside of the house.

Flexibility: The degree at which a coating is able to conform to movement or deformation of its supporting surface without cracking or flaking.

Floating (Floodlng): A concentration on a surface of one of the paint pigment ingredients giving rise to a color change.

Flow: The degree to which a wet paint film can level out after application so as to eliminate brush marks and produce a smooth uniform finish.

Fluid **Tip:** The orifice in a spray gun in which the needle is seated.

Fluorescent: A class of pigments which, when exposed to visible light, emit light of a different wave length producing a bright appearance.

Force Dying: The acceleration of drying by increasing the ambient temperature.

Foreign Thinner: Any thinner not recommended on the label or in published literature of the manufacturer, that can affect the coating's performance.

Fouling: Marine growth such as weeds or barnacles adhering to the surface.

Fungicide: A substance poisonous to fungi that retards or kills mold and mildew growth.

Galvanic Anode: A metal that, when properly connected to metallic structures of different composition, will generate an electric current.

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Galvanized Stool: Cold rolled steel that has been coated with a thin layer of metallic zinc by hot dipping or electroplating.

Gang Saw: A machine with multiple blades used to saw rough quarry blocks into slabs.

Gelled: A coating that has thickened to a jelly like consistency making it unusable.

Generic: Belonging to a particular family.

Glass **Seam:** Vein fillings of coarsely crystalline calcite, that do not necessarily decrease the strength of stone.

Gloss: The sheen or ability to reflect light.

Gloss Retention: The ability to retain the original sheen during weathering.

Glycol Ether: A group of relatively slow evaporating, strong solvents commonly utilized in epoxy coatings.

Granular Bau: Evenly graded mixture of fine and course aggregates to provide, when compacted, a smooth and even surface below footings.

Grit: An abrasive blasting media obtained from slag and various other materials.

Grit Blasting: Abrasive blasting using grit as the blasting media.

Grout: A mixture of cementitious material (cement, lime), sand, and sufficient water to make a consistency that flows without ingredient separation.

Hardener: An activator curing agent, catalyst, or cross-linking agent.

Hardness: The degree to which a material will withstand pressure without deformation or scratching.

Horder: A brick laid lengthwise across a wall and serving as a bond. A masonry unit laid flat with its largest dimension perpendicular to the face of the wall. It is generally used to tie two wythes of masonry together.

Hiding: The ability of a coating to obscure the surface it is applied to.

High Build: A term referring to a paint film that can produce a thick film in a single coat.

High-Strength **Adhesive:** A bonding agent of high ultimate strength used to join individual pieces of stone into preassembled units.

Holiday: Any discontinuity, bare, or thin spot in a painted area.

Hollow Wall: A wall built of solid masonry units laid in and so constructed to provide an air space within the wall.

Hot Rolled Steel: Steel that has been formed while still hot, generally characterized by the presence of bluish-black mill scale.

Hydrocarbon: Extracts from petroleum such as gasoline, lubricating oils, solvents, etc.

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Hydrophilic:	A substance that absorbs or has an affinity for water, water loving.
Hydrophobic:	A substance that does not absorb or exhibit an affinity for water.
Immersion:	Referring to an environment that is continuously submerged in a liquid, often water.
impact Resistance:	The ability to resist deformation or cracking from a forceful blow.
incise:	To cut inwardly or engrave, as in an inscription.
incombustible (Building Material):	Any building material that does not contain matter subject to rapid oxidation within the temperature limits of a standard fire test of not less than 2.5 hours duration. NOTE: Materials that continue burning after this time period are combustible.
Incompatibility:	Unsuitable for use together because of undesirable chemical or physical effects.
induction Time:	The period of time between mixing of two component products and the moment they can be used.
Inert Pigment:	A nonreactive pigment, filler, or extender.
Inhibitive Pigment:	A pigment that assists in the prevention of the corrosion process.
Inorganic:	The designation of compounds that do not contain carbon.
inorganic Zinc:	A coating based on a silicate resin and pigmented with metallic zinc that has excellent resistance to organic solvents and general weathering.
inscription:	Lettering cut in stone.
intercoat Adhesion:	The adhesion between successive coats of paint.
intercoat **Contamination:**	The presence of foreign matter such as dust or dirt between successive coats of paint.
internal Mix:	A spray gun in which the fluid and air are combined before leaving the gun.
interior Wail:	Any wall entirely surrounded by the exterior walls of a building.
intumescent Coating:	A fire retardant coating that when heated produces nonflammable gasses trapped by the film and converting it to a foam, thereby insulating the substrate.
ion:	An atom or group of atoms possessing a positive or negative electric charge as a result of having lost or gained an electron.
iron Oxide:	An oxide of iron. The natural occurring state of steel.
Isopropyl Alcohol **(IPA):**	A volatile, flammable liquid used as a solvent and commonly known as rubbing alcohol.

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Joint:	The space between the adjacent surfaces of two members or components joined and held together by nails, glue, cement, mortar, or other means.
Ketone:	An organic compound with a carbonyl group attached to two carbon atoms. Usually indicates a strong, fast evaporating solvent.
Lacing **Course:**	A course of brick, or several adjacent courses considered collectively, inserted at frequent intervals, as in a stone wall as a bond course.
lacquer:	A coating comprised of a synthetic film forming material dissolved in organic solvents and dried by solvent evaporation.
Lacquer Thinner:	Term commonly used to describe a solvent blend of ethyl alcohol, ethyl acetate, and toluene.
Laitance:	An accumulation of fine, loosely-bonded particles on the surface of fresh concrete, caused by the upward movement of water.
Latex:	A stable dispersion of a polymer substance in an aqueous medium; a common term for water reducible coatings.
Lead-Free:	Contains by weight less than 0.5% lead for industrial products and less than 0.6% lead in consumer products.
Leafing:	The orientation of pigment flakes in a horizontal plane, usually aluminum.
Lewis Bolt:	A tapered head wedged in a tapered stone recess for hanging soffitt stones. Box **Lewis:** A tapered metal box wedged in the top of columns or other heavy stones for hoisting. Lewis Holes: Sinkages in the top beds of stone to engage Lewis pins for hoisting.
Lifting:	Softening and raising or wrinkling of a previous coat by the application of an additional coat; often caused by coatings containing strong solvents.
Unoleum:	An inexpensive form of resilient floor covering that is manufactured of ground cork and oxidized linseed oil. Linoleum is applied to a course fabric backing and possesses a low resistance to staining, dents, and abrasion.
Untel:	A horizontal structural member that supports the load over an opening such as a door or window.
Untel **(Safety):**	A lintel of wood or other suitable material placed behind the main lintel or behind an arch; generally used in conjunction with a relieving arch.

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Masonry: Stone, brick, concrete, hollow-tile, concrete-block, gypsum-block, or other similar building units, materials, or a combination of the same, bonded together with mortar to form a wall, pier, buttress, or similar mass.

Mastic: A pasty material used as a cement (as for setting tile), a protective coating (as for thermal insulation or waterproofing), or a term used to describe a heavy bodied coating.

Metalizing: A method of applying atomized, molten metal such as zinc and aluminum to a surface.

Methyl Ethyl Ketone **(MEK):** A low boiling, highly volatile flammable solvent with extremely good solubility for most vinyls, urethanes, and other coatings.

Methyl **Isobutyl** Ketone **(MIBK):** A medium boiling solvent commonly used in vinyls.

Micron: A micrometer or one millionth of a meter.

Mil: One one-thousandth of an inch; 0.001 inches. Commonly used to denote coating thickness.

Mildew: A superficial growth of living organic matter produced by fungi in the presence of moisture; results in discoloration and decomposition of the surface.

Mill Scale: A layer of iron oxide formed on the surface of steel plates during hot rolling; bluish in appearance.

Mineral Fiber: Fibers formed from mineral slag, the most common being glass wool, used in loose or batt form for thermal and/or fireproofing.

Mineral **Spirits:** A refined petroleum distillate having a low aromatic hydrocarbon content and low solubility; suitable for thinning of alkyd coatings.

Miscible: Capable of mixing or blending uniformly.

Mist Coat: A thin tack coat usually applied to fill porous surfaces such as zinc rich primers.

Miter: The junction of two units at an angle. The junction line usually bisects on a 45 degree angle.

Monomer: A substance of low molecular weight molecules capable of reacting to form longer molecules called polymers.

Mortar: A mixture of cementitious materials and aggregate, with or without the addition of plasticizers or other admixtures, reduced to a plastic state by the addition of water and suitable for use to bind masonry units together.

Mottled: Spots of different tones and colors next to each other resulting in a blotchy effect on the coating film.

Mudcracking: A paint film defect characterized by a broken network of cracks in the film.

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Muriatic Acid:	Concentrated hydrochloric acid often diluted and used for etching concrete.
Natural Bed:	The horizontal stratification of stone as it was formed in the deposit.
Neat:	Generally, basecoat plaster, mortar, or grout to which sand is added at the job.
Neutral:	A liquid that is neither acid nor alkali such as water; pH7.
Non-Bearing Wall:	Any wall that carries no load other than its own weight.
Non-Drying **Oil:**	An oil that undergoes little or no oxidation when exposed to air and therefore has no film forming properties.
Nonferrous:	A term used to designate metals or alloys that do not contain iron; eg., brass, aluminum, magnesium.
Nonflammable:	A compound that does not burn in the presence of a flame.
Nonvolatile:	The paint portion left after the solvent evaporates; solids.
Oil Length:	The ratio of oil to resin expressed as a percentage of oil by weight in the resin. Used to determine the physical properties of a resin.
Opacity:	The ability of a paint film to obliterate or hide the surface color it is applied to.
Orange Peel:	The dimpled appearance of a dried paint film resembling the peel of an orange.
Organic:	Designation of any chemical compound containing carbon.
Organic **Zinc:**	A zinc-rich coating utilizing an organic resin such as epoxy.
Osmosls:	The diffusion of liquid through a paint film or other such membrane.
Overspray:	Sprayed coating that is dry when it hits the surface resulting in dusty, granular, adhering particles; reducing gloss and presenting a poor appearance.
Oxldatlon:	The formation of an oxide; the curing mechanisms for alkyds.
Paint:	(v.) To apply a thin layer of coating to a substrate by brush, roller, spray, or other suitable method. (n.) A pigmented liquid designed for application to a substrate in a thin layer, which is then converted to an opaque solid film.
Panel Wall:	A non-bearing wall in skeleton construction, built between columns or piers, and wholly supported at each story.
Paneling:	A sheet of plywood, particleboard, or other similar product, usually of a standard size, such as 4x8 feet.
Parglng:	To coat or plaster with mortar or grout.
Parquet **Flooring:**	A wood flooring composed of tongue-and-groove hardwood boards.
Partition:	A wall that subdivides spaces within any story of a building.

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Party Wall:	A wall used, or adapted for use for joint service by adjoining buildings.
Pass:	The motion of a spray gun in one direction only.
Passivate:	To make a surface such as steel inert or unreactive, usually by chemical means.
Paste:	The product of the dispersion process. It is usually very high viscosity and requires dilution prior to application; a concentrated pigment dispersion used for shading or a composition of Portland cement, water, and air.
Pattern:	The shape or stream of material coming from a spray gun.
Peeling:	A paint or coating lifting from the surface due to poor adhesion.
Perm:	A measure of water vapor movement through a material (grains per square foot, per hour, per inch of mercury difference in vapor pressure).
Permeability:	The degree to which a membrane or coating film will allow the passage or penetration of a liquid or gas.
pH:	A measure of acidity and alkalinity; pH 1-7 is acid and pH 7-14 is alkaline.
Phenolic:	A synthetic resin used for heat or water resistance.
Phosphatlrlng:	A pretreatment of steel by a chemical solution containing metal phosphates and phosphoric acid to temporarily inhibit corrosion.
Pickling:	The treatment of steel for the removal of rust and mill scale by immersion in a hot acid solution containing an inhibitor.
Pier:	A column of masonry, usually rectangular in horizontal cross-section, used to support other structural members.
Piers:	Masonry or concrete supports, set independently of the main foundation.
Pigment:	A finely ground natural or synthetic, insoluble particle adding color, opacity, or corrosion inhibition to a coating film.
Pigment Grind:	The action of dispersing a pigment in a liquid vehicle.
pigment Volume Concentration (PVC):	The percent by volume occupied by pigment in the dried film of paint generally expressed as a percentage.
Pigment/Binder Ratio:	A ratio of total pigment to binder solids in paint.
Pilaster:	A pier built as an integral part of a wall and projecting slightly from either vertical surface thereof.
Plnhollng:	A film defect characterized by small, pore-like flaws in a coating that extend entirely through the film.
Pipe Column:	A column made of steel pipe and often filled with concrete,

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Plaster:	A cementitious material and aggregate that, when mixed with a suitable amount of water, forms a plastic paste. When applied to a surface, the paste adheres to it and subsequently hardens, preserving in a rigid state the form or texture imposed during the period of plasticity.
Plasticizer:	An agent added to the resin to aid in flexibility.
Plumb:	Exactly perpendicular; vertical.
Pointing:	Pushing mortar into a joint after masonry is laid.
Polyester Resin:	A group of synthetic resins that contain repeating ester groups. A special type of modified alkyd resin.
Polymer:	A substance of molecules that consists of one or more structural units repeated any number of times.
Polymerization:	A chemical reaction in which two or more small molecules combine to form large molecules containing repeated structural units.
Polyurethane:	Reaction product of isocyanate with any of a wide variety of other compounds containing an active hydrogen group. Polyurethane is used to formulate tough, abrasion-resistant coatings.
Polyvinyl Chloride (PVC):	A hard, tough, plastic solid used for plastics and coatings, commonly known as vinyl.
Porosity:	The presence of numerous minute voids in a cured material.
Post:	A timber set on end to support a wall, girder, or other member of the structure.
Pot **Life:**	The length of time a paint material is useful after its original package is opened, a catalyst, or other curing agent is added.
Practical Coverage:	The spreading rate of a paint calculated at the recommended dry film thickness and assuming 15% material loss.
Preassembled Units:	Two or more stones combined into a single unit by the use of epoxy resins, steel framing, or concrete backing.
Precast Concrete:	A concrete member that is cast and cured in other than its final position.
Primer:	The first coat of paint applied to a surface, formulated to have good bonding, wetting, and inhibiting properties.
Profile:	The term used to describe the anchor pattern of a surface produced by sandblasting, acid etching, or similar method.
Pyrometer:	An instrument used to measure surface temperature.
Quarry:	The location of an operation where a natural deposit of stone is removed from the ground.

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QUV:	An accelerated testing device designed to evaluate the fading properties of a coating by exposure to high intensity, ultraviolet light.
Raggle:	A groove or channel made in a mortar joint (or in the solid masonry material) to receive roofing, metal flashing, or other material to be sealed in the masonry.
Recess:	A sinkage.
Reducer:	Commonly known as thinner.
Reflectance:	The ratio of the intensity of reflected light to that of incidental light.
Reinforced Brick **Masonry** (R-B-W):	Brick masonry in which metal is embedded in such a' manner that the two materials act together in resisting forces.
Reinforcement:	Structural steel shapes, steel bars, rods, wire mesh, or expanded metal embedded or encased in brick, other masonry, or concrete to increase its strength.
Reinforcing:	Steel rods or metal fabric placed in concrete slabs, beams, or columns to increase their strength.
Relief or **Relieve:**	Projection of ornamentation,
Reprise:	Inside corner of a stone member with a profile other than a flat plane.
Resilient Flooring:	A floor covering that is very durable and has the ability to resume its original shape, such as linoleum.
Resin:	A group of organic materials, either natural or synthetic, that can be molded or dissolved.
Retarder:	Any material added to concrete, mortar, or grout that slows up its natural set.
Reveal:	The exposed portion of a stone between its outer face and a window or door set in an opening.
Rheology:	The science characterizing fluid deformation or flow.
Roller:	A cylinder covered with lamb's wool, felt, foamed plastics, or other materials used for applying paint.
Rowlok:	A brick laid on its edge. Frequently spelled rolok.
Rubble **Masonry:**	Uncut stone, used for rough work, foundations, backing, and the like.
Runs:	Sogging and curtaining of a coating or paint film, usually caused by improper thinning, excessive film build, or poor application techniques.
Rust:	The reaction product of steel, oxygen, and water.
Rustication:	A recessed surface cut around or across the face of a stone to produce shadow accent.

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Sag Redstance:	The ability of a paint to be applied at proper film thicknesses without sagging.
Sagging:	The downward movement of a paint film on a vertical surface, between the time of application and drying, resulting in an uneven coating having a thick lower edge.
Salt Atmosphere:	A moist, heavily ladened air with a high chloride concentration; used as a test for accelerated corrosion evaluations and also present near sea coast areas.
Salt Fog **Test:**	A cabinet designed to accelerate the corrosion process in evaluating coatings; combines 100% humidity with a 5% salt concentration at 1 00°F in an enclosed cabinet.
Sand Float **Finish:**	Lime mixed with sand, resulting in a textured finish.
Saponification:	The alkaline hydrolysis of fats whereby a soap is formed; typical reaction between alkyds and galvanized metals resulting in peeling.
Satin Finish:	A descriptive term generally referenced to paints with a 60° gloss reading between 10 and 40.
Scaffold or **Staging:**	A temporary structure or platform enabling workmen to reach high places.
Sealant:	A resilient compound used as the final weatherface in stone joints. (This term is sometimes misused to indicate clear water-repellent treatments that are sometimes sprayed or otherwise applied to masonry.)
Sealer:	A coating used on absorbent surfaces prior to paint.
Settling:	The sinking of pigments, extenders, or other solid matter in a paint on standing in a container, with a consequent accumulation on the bottom of the can.
Shade:	A term employed to describe a particular hue or tone.
Shelf **Life:**	The maximum time interval in which a material may be kept in a usable condition during storage.
Shop Primer:	An inexpensive, rust inhibiting primer designed to protect steel from general weathering immediately after fabrication and before final coating.
Shot Blasting:	Abrasive blasting with round iron shot, or any material that retains its spherical shape, for peening purposes.
Shot Sawed:	Description of a finish obtained by using steel shot in the gang sawing process to produce random markings for a rough surface texture.
Shrinkage:	The volume change in concrete caused by drying; normally occurring during the hardening process.
Silica Sand:	Clean sand made up of sharp silica particles, not containing dirt or clay, used for abrasive blast cleaning.
Silicone Resins:	Resins based on silicone instead of carbon, generally used for their outstanding heat resistance and water repellency.

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Sill Course:	(See String Course.)
Skeleton Construction:	A type of building construction in which all loads are transmitted to the foundation by a rigidly connected framework of suitable material, with the enclosing walls supported by girders or by the floor at each floor level.
Skew:	Inclination in any direction.
Skinning:	The formation of a solid membrane on the top of a liquid, caused by partial coat curing or drying during storage.
Slip Joint:	A connection that permits vertical or horizontal movement of the cladding with respect to the structural frame.
Smooth **Finish:**	A finish of minimum textural quality, presenting the least interruption of surface. Smooth finish may be applied to any surface, flat or molded. It is produced by a variety of machines.
Soffitt:	The finished underside of a lintel, arch, or portico.
Soldier:	A brick laid on its end so that its longest dimension is parallel to the vertical axis of the face of the wall.
Solid Wall:	A wall built of solid masonry units, laid contiguously, with the spaces between the units completely filled witkmortar. Also walls built of solid concrete.
Solids by Volume:	The percentage of the total volume occupied by nonvolatile compounds.
Solids by **Weight:**	The percentage of the total weight occupied by nonvolatile compounds.
Solvent Entrapment:	The encapsulation of solvent within a cured paint film due to improper drying conditions; resulting in a noncontinuous film.
Solvent:	A liquid in which another substance may be dissolved.
Sound Rusted Substrate:	A rusted substrate cleaned of all loose rust and other loose materials, but not cleaned to bare metal.
Spall:	A small fragment removed from the face of stone, brick, masonry, or concrete material by a blow or due to weather.
Span:	The distance between structural supports such as walls, columns, piers, beams, girders, and trusses.
Spandrel Wall:	That part of a panel wall above the top of a window in one story and below the sill of the window in the story above. Also, the space included between the extrados of two adjoining arches and a line approximately connecting their crowns.
Spoclfltation:	A set of instructions detailing the plan for a project coating; a list of criteria for a coating.
Splay:	A beveled or slanted surface.
Spray Head:	The combination of needle, tip, and air cap.

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Spray Pattern:	The configuration of coating sprayed on the surface.
Spread Rate:	Coverage, usually at the specified dry film thickness.
Springing Line:	A line marking the level from which the curve of an arch or vault rises from the upright or impost.
Stress Corrosion Cracking:	Spontaneous cracking produced by the combined action of corrosion and static stress.
Stretcher:	A masonry unit laid flat with its longest dimension parallel to the wall face.
String Course:	A narrow, vertically faced and slightly projecting course in an elevation, such as window-sills that are made continuous. Also, horizontal moldings running under windows, separating the walls from the plain part of the parapets, dividing towers into stories, stages, and the like.
Stringing Mortar:	The name applied to the method by which a brick-layer picks up sufficient mortar for a number of bricks and spreads it before laying the brick.
Strip Flooring:	Hardwood finish flooring in the form of narrow tongue-and-groove strips, commonly made of mahogany, maple, or oak.
Strong Solvent:	Any solvent capable of dissolving large quantities of a specified subject.
Structural Facing Tiles:	Kiln-fired structural clay with an impervious ceramic face.
Structural lube Columns:	Structural column shaped as a square or rectangle.
Stud:	One of a series of slender wood or metal vertical structural members placed as supporting elements in walls and partitions.
Substrate:	The surface to be painted.
support:	An angle, plate, or other stone that carries a gravity load.
Surfacer:	Pigmented composition for filling depressions in order to obtain a smooth, uniform surface before applying the finish coat.
Surfactant:	An additive that reduces surface tension thereby improving wetting, helping pigment dispersal, or inhibiting foam.
Surround:	An enframement.
Suspension:	A relatively coarse, noncolloidal dispersion of solid particles in a liquid.
Sweat-Out:	Soft, damp mortar caused by poor drying conditions.
Swedge Anchor:	An anchor bolt, threaded at one end and swedged or flattened in spots along the shank to produce greater holding power.
Synthetic:	Manufactured, as opposed to naturally occurring.
Tabor Abraser:	An instrument used to measure abrasion resistance.

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Tall Beam:	A relatively short beam or joist supported in a wall on one end and by a header at the other.
Tails:	Finger-like spray pattern produced by improper gun or coating material adjustment,
Tape Time:	The drying time of a coating required prior to masking sections for lettering or striping after which masking tape will not distort the finish.
lapping:	Setting a brick down on its bed of mortar with a light blow of the trowel blade or end of handle.
Temper:	To moisten and mix clay, plaster, mortar, and similar materials to the proper consistency for working.
Template:	A pattern used in the fabrication operation.
Texture:	Any finish other than a smooth finish.
Thermocouple:	A temperature measuring device.
Thermoplastic:	Resins having the property of becoming soft upon the application of heat but which regain hardness after cooling.
Thermosetting:	Resins having the property of becoming insoluble or hard upon the application of heat.
Thinners:	A liquid (solvent) added to a coating to adjust viscosity.
Thixotropic:	An adjective describing full bodied materials that undergo a reduction in viscosity when shaken, stirred, or otherwise mechanically disturbed but which readily recover their original full bodied condition upon standing.
Throat:	The undercut of a projected molding to form a drip.
Tie:	Any unit of material used to resist the spreading of a wall, or the separation of the two solid parts of a hollow wall.
Tolerance:	Acceptable dimensional allowance, under or over ideal net sizes.
Toluene:	An aromatic solvent with a high boiling range and low flash point classified as a strong solvent.
Tooling:	Compressing and shaping the face of a mortar joint, usually with a special tool, other than a trowel.
Tooth:	The profile, mechanical anchor pattern or surface roughness.
Toothing:	The temporary end of a wall built so the end stretcher of every alternate course projects.
Trim:	Stone’ used as sills, copings, enframements, etc., with another material facing.
Tuck **Pointing:**	A method of refinishing old mortar joints. The loose mortar is dugout and the tuck is filled with fine mortar which is left projecting slightly or tooled.

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Two-Pack:	A coating supplied in two parts that must be mixed in the correct portions before use in order to cure.
Undercoat:	The coat applied to the surface after preparation and before the application of a finish coat.
Undercut:	Cut or molded to present an overhanging part, i.e., a drip mold.
Underfilm Corrosion:	Corrosion that occurs under films in the form of randomly distributed hair lines.
Vapor **Barrier:**	Material used to retard the movement of water vapor into walls, and prevent condensation in them. Usually considered as having a perm value of less than 1 .0. Applied separately over the warm side of exposed walls or as a part of batt or blanket insulation.
Vapor **Transmission Rate:**	The rate at which moisture passes through a material or coating.
Vehicle:	The liquid portion of a paint in which the pigment is dispersed. Comprised of binder and thinner.
Veneer:	A facing of masonry material attached but not bonded to the backing.
Vinyl **Copolymer:**	A resin produced by copolymerizing vinyl acetate and vinyl chloride.
Viscometer:	One of several types of instruments for measuring a liquid's viscosity.
Viscosity:	A measure of fluidity of a liquid.
Viscosity cup:	An efflux viscometer utilizing a measured volume of liquid flowing through a precise orifice.
Voids:	Holidays or holes in a coating or material.
Volatile Content:	The percentage of materials that evaporate from a coating.
Volatile Organic Compounds **(VOC):**	A measure of the total amount of organic compounds evaporating from a coating film, excluding water.
Volume Sollds:	The volume of the nonvolatile portion of a composition divided by the total volume and expressed as a percent used to calculate coverage rate.
Wall **Paper:**	Paper, paper-like material, or plastic film used as a decorative facing for walls.
Wall **Plate** Anchor.	A machine bolt anchor, with a head at one end and threaded at the other, and fitted with a plate or punched washer to securely engage the brickwork or concrete and hold the wall plate or other member in place.
Wall.Tie:	Strip of metal used for tying a facing veneer to the body of a wail.
Walls, Bearing:	A wall supporting a vertical load in addition to its own weight.

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Wash Primer:	A thin paint, usually a chromate, designed to promote adhesion or to be used as a barrier coat.
Water Blasting:	Blast cleaning of metal using high velocity water.
Water Repellent:	Any ot several types of clear liquids used to render masonry walls less absorptive. These treatments are said to maintain a material's ability to breathe away moisture, as distinct from "sealers" that form impervious, non-breathing coatings.
Water Retentivity:	Flow and resistance to segregation are factors affecting workability, which in turn are affected by the properties of both the cementitious materials and the aggregate.
Water Spoffing:	A surface defect caused by water droplets depositing a circular ring of contaminants.
Water Table:	A slight projection of the lower masonry or brickwork on the outside of a wall and slightly above the ground as a protection against water.
Waterproofing:	(See Dampproofing.)
Weatherometer:	A machine designed for the accelerated testing of coatings.
Weld Slag:	Amorphous deposit formed during welding.
Weld Splatter:	Beads of metal left adjoining the weld.
Welded Wire Mesh:	A series of longitudinal and transverse wires arranged substantially at right angles to each other and welded together at all points of intersection.
Wet on Wet:	The technique of painting whereby the second coat is applied before the first coat has dried and the composite film then dries as a whole.
Wet Sandblasting:	The incorporation of water into the sandblasting operation in order to minimize dust.
Wetting:	The ability of a vehicle to flow onto the surface in order to achieve a good bond.
White Rust:	The zinc oxide formed on galvanized metal.
With(e) or **Wyth(e):**	A continuous vertical 4-inch (lo-cm.) or greater section or thickness of masonry.
Wooden Brick:	Piece of seasoned wood, made the size of a brick, and laid where it is necessary to provide a nailing space in masonry walls.
Workabillty:	That property of freshly mixed concrete or mortar that determines the ease and homogeneity with which it can be mixed, placed, compacted, and finished.
Xylene:	A flammable aromatic hydrocarbon solvent used in epoxies and fast drying alkyds.
Zinc Dust:	Finely divided zinc metal used as a pigment in protective coatings.

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Zinc **Oxide:**	A rust inhibitive pigment used in paints also provides color retention and surface hardness.
Zinc Rich Primer:	An anti-corrosive primer for iron and steel incorporating zinc dust in a concentration sufficient to provide cathodic protection.

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END OF SUBSECTION

APPENDIX C

TECHNICAL **BULLETINS/UPDATES/ADVISORIES**

index of Bulletins/Advisories
followed by Bulletins/Advisories
as developed

APPENDIX C

TECHNICAL ADVISORY T0501 • 1

DATE: 10/91
SYSTEM: Roofing (CSI 07000)
ASSEMBLY: Built-Up (CSI 07510)
SUBJECT: Roof Top Lighting and Insect Damage

"In March, 1988 a professional roofing magazine article described a bizarre but apparently avoidable, phenomenon. In about a dozen documented cases ranging from Washington State to Florida: beetles have bored through roof membranes, causing leaks. It was determined that the beetles are attracted to lights (especially mercury vapor) mounted on, over, or near roof surfaces, including nearby billboard lighting. Falling to the roof, they burrow into the roof substrate, seeking protection from the sun during the day. The types of roof membrane affected were asphaltic BUR, modified bitumen, and single-ply roofing. Evidently, no instance has yet been found among coal tar BUR. It is advisable to exercise care in the selection of roof membranes where billboards may exist adjacent to a planned roof installation, or when rooftop lighting is required. The roof specifier should discuss the types of luminaire to be used with project electrical engineers before mercury vapor fixtures are specified."

Source: Roofing Design Criteria Options. R.D. Herbert II

EXAMPLE: TECHNICAL ADVISORY BULLETIN

END OF SUBSECTION

APPENDIX D

REVISIONS SUMMARY

AT A GLANCE SUMMARY OF ALL

REVISIONS UP TO LATEST REVISION DATE

APPENDIX D

END OF SUBSECTION