Department of Energy

Condition Assessment Survey (CAS) Program

Deficiency Standards & Inspections Methods Manual

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for
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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?

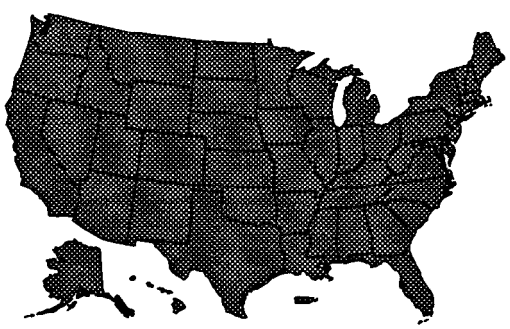
  Strategies for beginning to use CAS and the key roles facility managers and CAS inspectors play within the CAS process are detailed.

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.

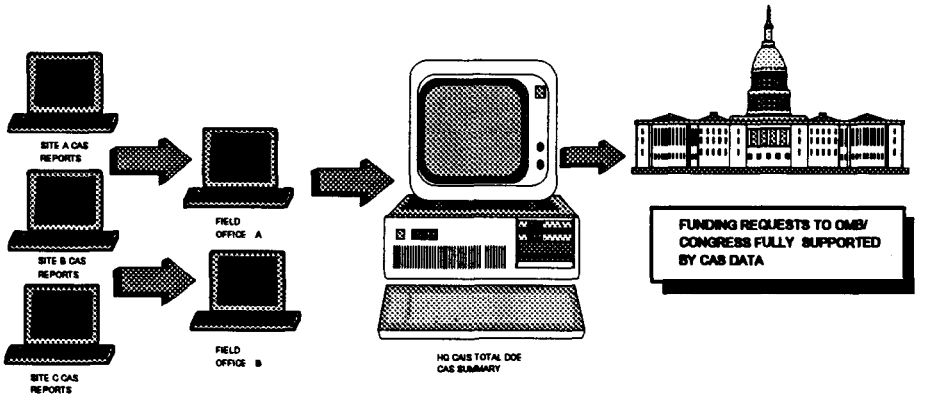
The current state of condition assessment across all DOE assets is mixed. While DOE regulations dictate facility assessments be made, no one methodology is mandated to conduct them. As a result, DOE surveys have varied from site to site, with some locations providing exhaustive in-depth analysis while 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.

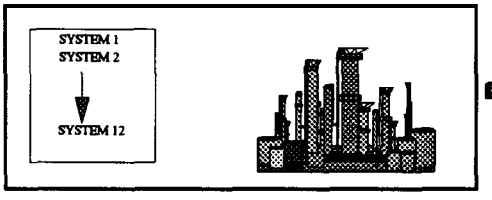
Develop Supportable Funding **Requests:**

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

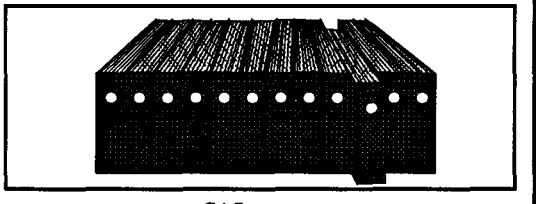
WHAT IS CAS?

A SYSTEMATIC INSPECTION APPROACH INSTITUTED AT ALL SITES



WORK BREAKDOWN STRUCTURE

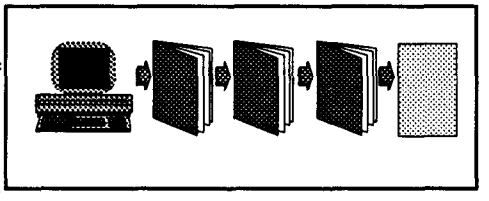
① FACILITIES DIVIDED IN TWELVE SYSTEMS



CAS MANUALS

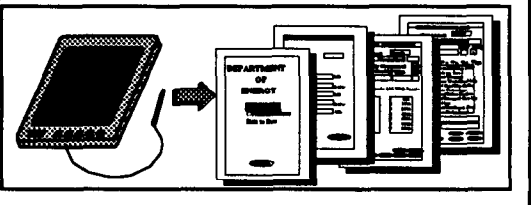
② 12 CAS SYSTEM MANUALS CONTAINING DEFICIENCY & INSPECTION STANDARDS

CAS SYSTEM



CAIS DATA PROGRAM

④ CAIS DATA SUPPORT CAS INSPECTION ANALYSES



STATE-OF-THE-ART HAND-HELD COMPUTER

③ HAND-HELD COMPUTER INSPECTION PROGRAM BASED ON 12 CAS MANUALS

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 fail 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.)	CONTRO l. 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	0.08 SYSTEM
CONVEYING SYSTEMS	0.07 SYSTEM
MECHANICAL SYSTEMS	0.08 SYSTEM
ELECTRICAL SYSTEMS	0.08 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
18000	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)

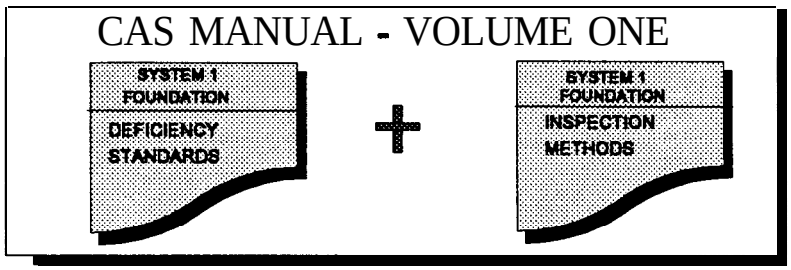
*NOTE: This section supersedes Means 0.10 category and includes FIS 700 Series Asset Codes.

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 conjunction 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.

Appendix 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.

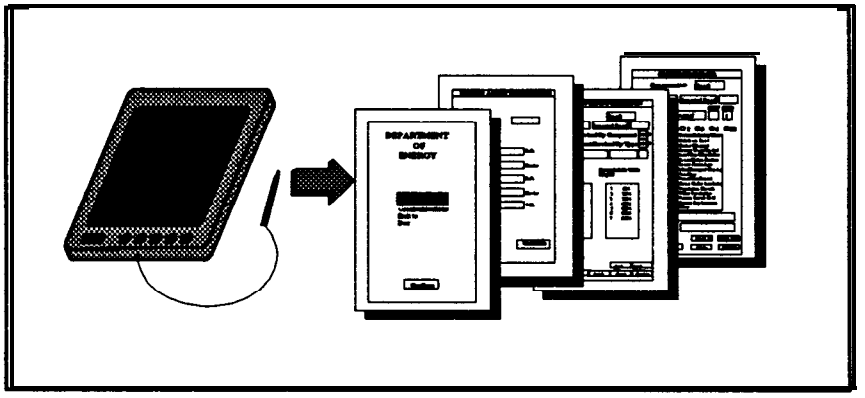
Appendix D Revlslons Summary - All revisions listed in chronological sequence. The last revision listed will be the most current modification.

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-Art 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.

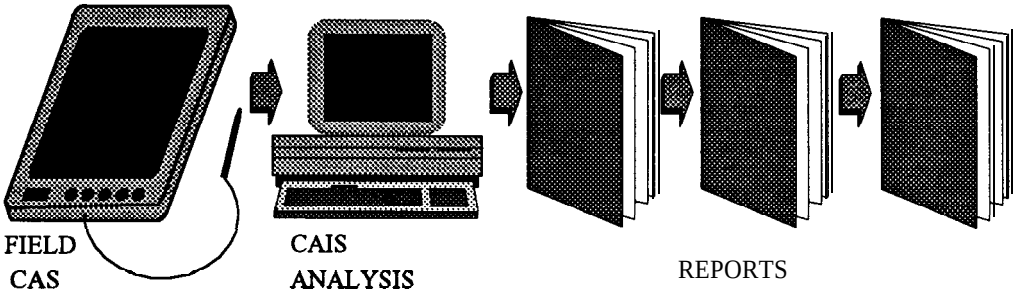
In short, the CAS process will be conducted in a carefully structured, "standardized" manner to ensure that the quality of raw inspection data is consistent throughout all DOE installations,

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:

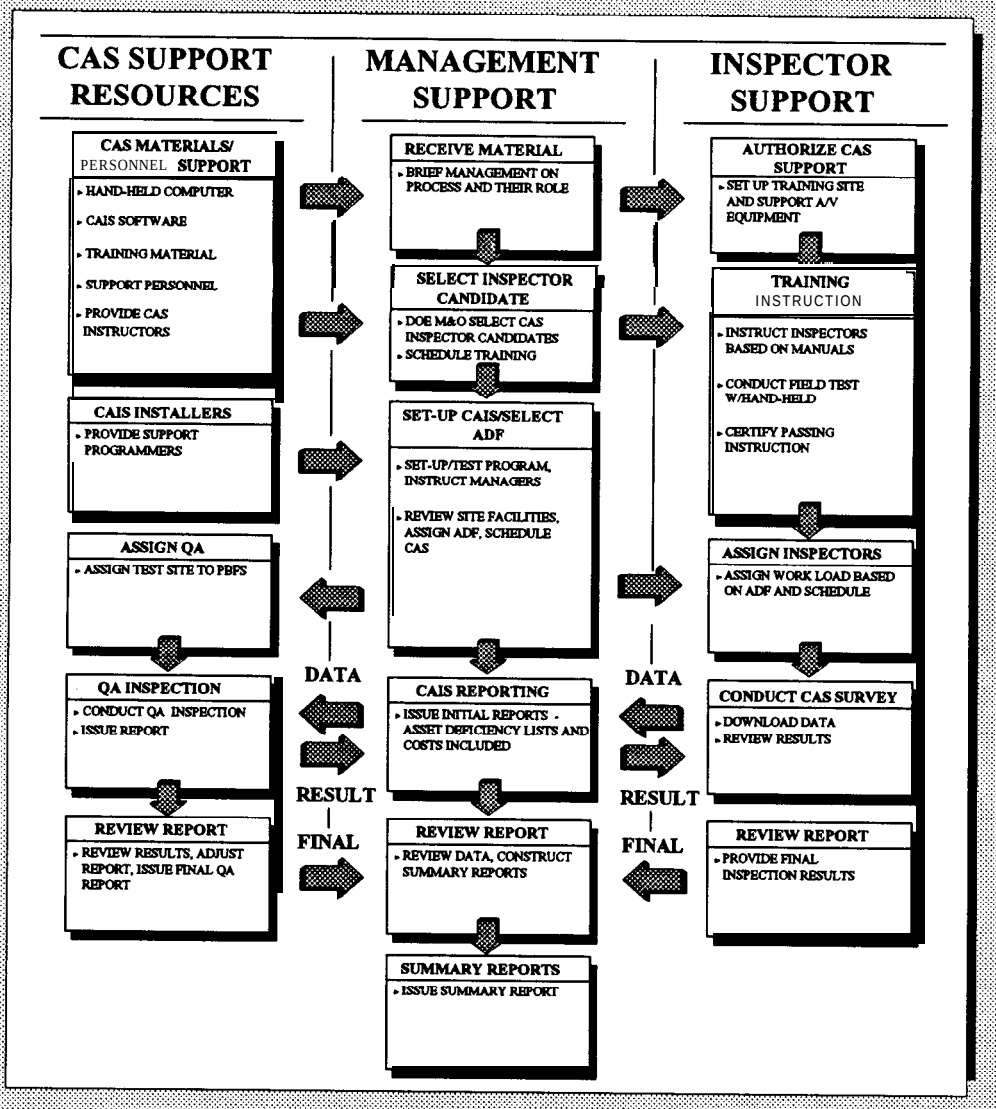
Costs to accomplish repairs and replacements are generated by the manipulation of field data in the CAIS program, which employs several methods including determining cost as a percentage of total replacement and/or direct entry of costs. (See Section 1, Subsection 1.1 for discussion of cost development.)

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:

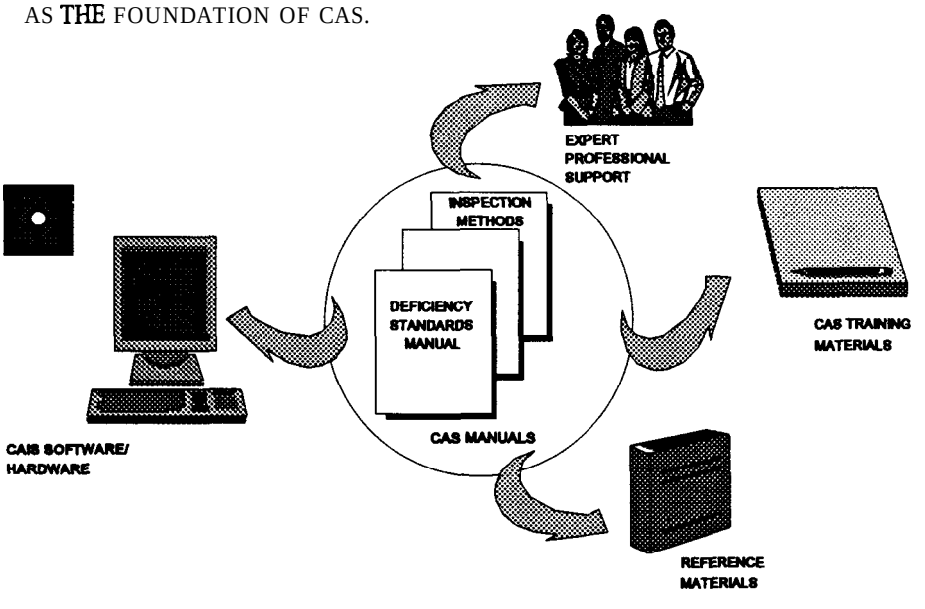
Without highly skilled, knowledgeable inspectors, the CAS Program will not succeed. The integrity of these inspectors and their expertise will ensure that the base data supporting the entire CAS process will be an accurate reflection of the condition of the DOE inventory of facilities and assets.

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:

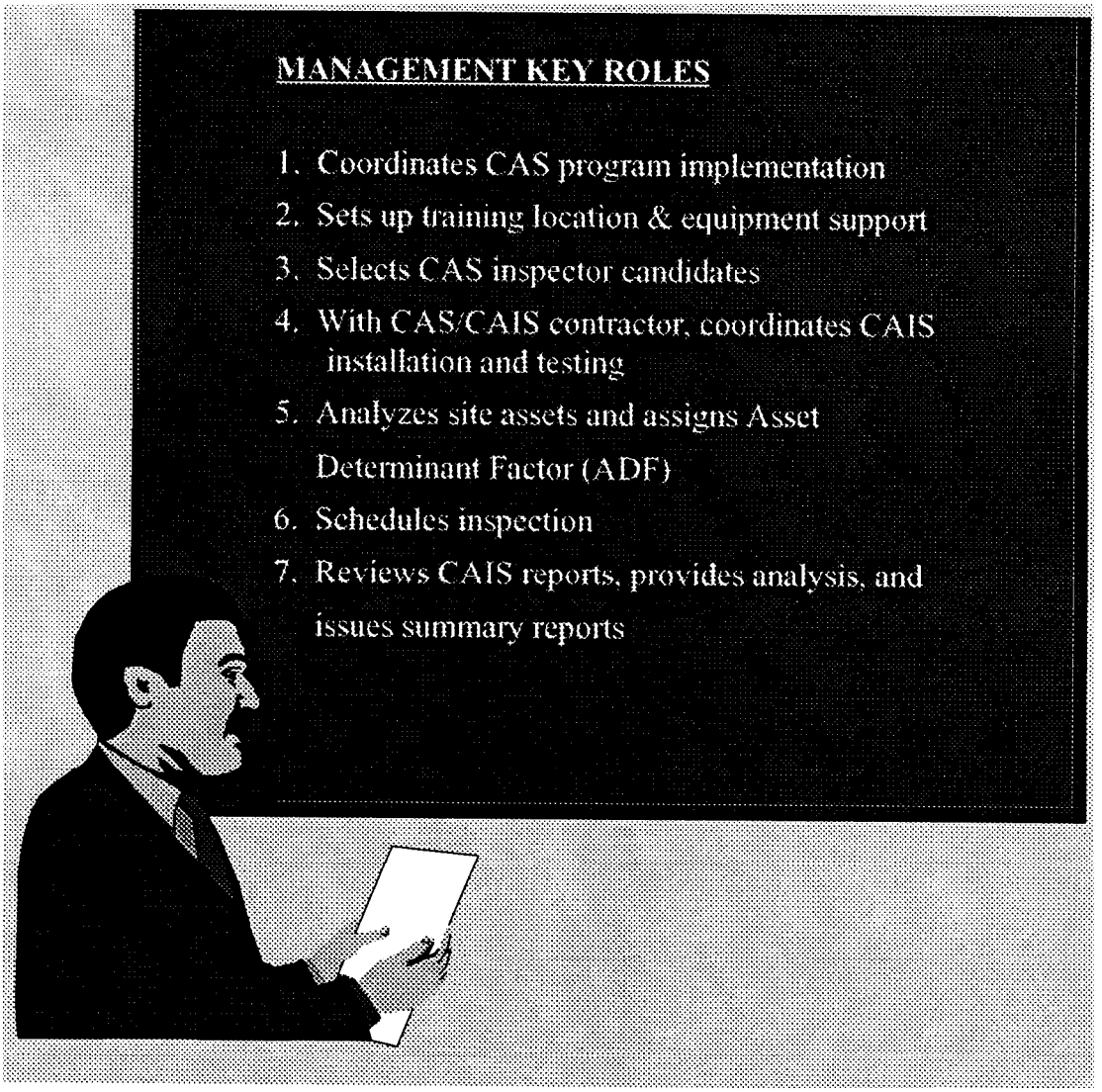
A key CAS Program element is the CAIS. Expert programmers will supervise the installation of the PC-based program and provide guidance and instruction for DOE M&O managers in using the system.

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?



INTRODUCTION

HOW IS CAS IMPLEMENTED? - The Management 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:

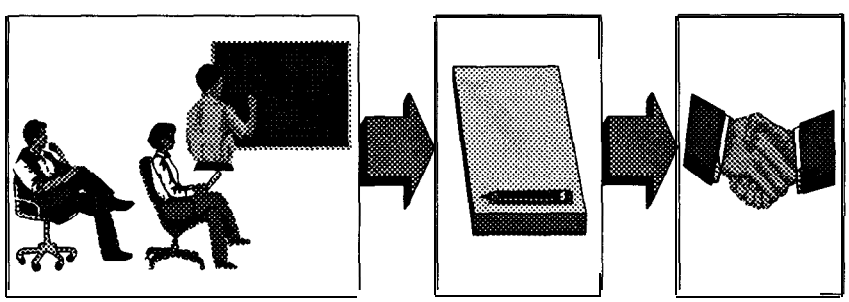
The process of up-loading CAS field data to the PC-based CAIS program will be demonstrated to the M&O CAS managers. Analysis processes will be examined using predetermined, formatted reports. Final management project "sorts" and prioritization schemes, and construction of summary reports for higher authorities,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

INTRODUCTION

HOW IS CAS IMPLEMENTED?

CAS INSPECTORCERTIFICATION

- 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:

Proqualification:

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:

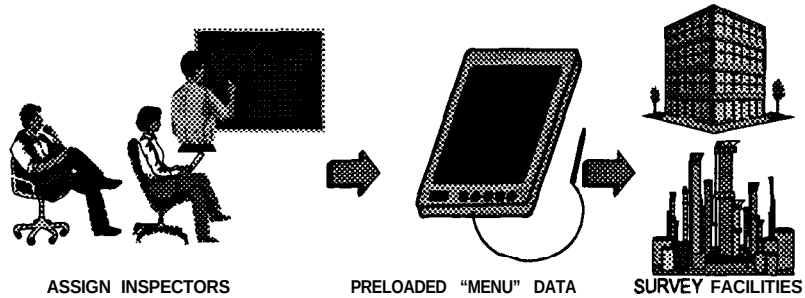
At the completion of the CAS training, each candidate is required to take and pass a written examination based on the material covered in the class. It is the goal of the training team to pass 100% of the candidates. Those having difficulty will receive additional instructor attention during the class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



ASSIGN INSPECTORS PRELOADED "MENU" DATA SURVEY FACILITIES

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:**

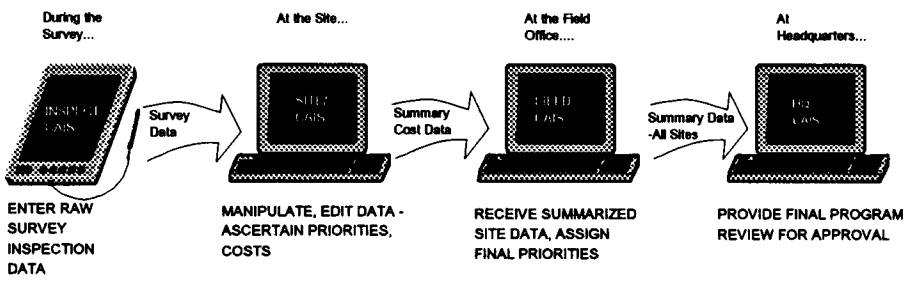
After completing the CAS Inspection, information is uploaded to the PC-based CAIS system. "Universal" reports showing all asset deficiencies, observations, associated cost, scheduling priorities, and repair purposes will be produced. As part of the QA, the Inspector will review this information with 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 program 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 Survev 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 short-term and mothballed facilities.

ADF#	Guidance	Description	Systems
1	Existing asset (>3 years), Full program projected to last 5 years	CAS Inspection (base CAS - assembly level or optional component level) 1	ALL
2	Existing temporary asset (>3 years) program projected to last <5 years	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)'	0.05
6	Asset ARCHITECTURAL only	ARCH/STRUCTURAL inspection (base CAS - assembly level or optional component level)'	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)'	0.12
10	As developed by each site	As constructed by site2	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.

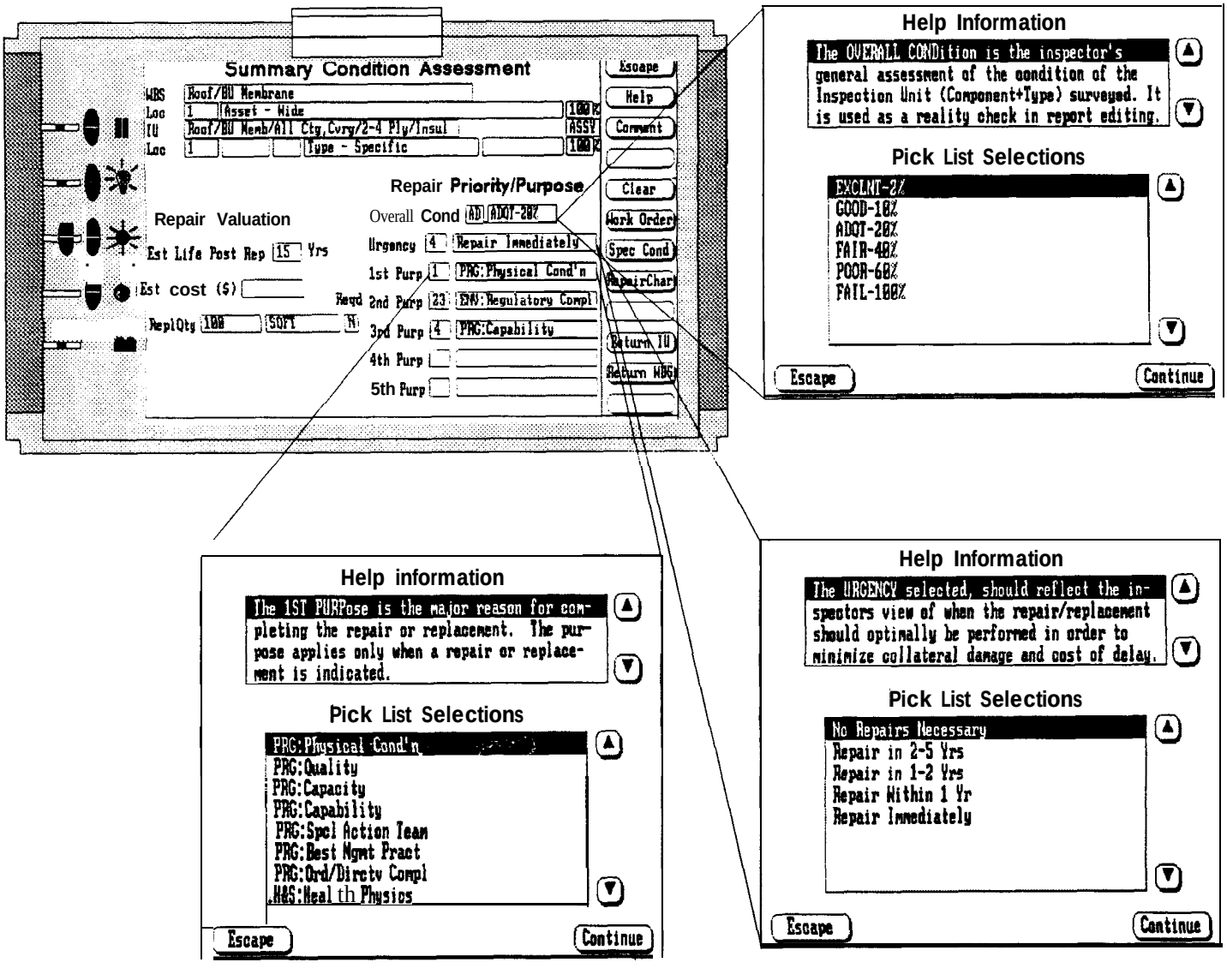
ASSET DETERMINANT FACTOR/CAS REPAIR CODES/CAS COST FACTORS

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.)

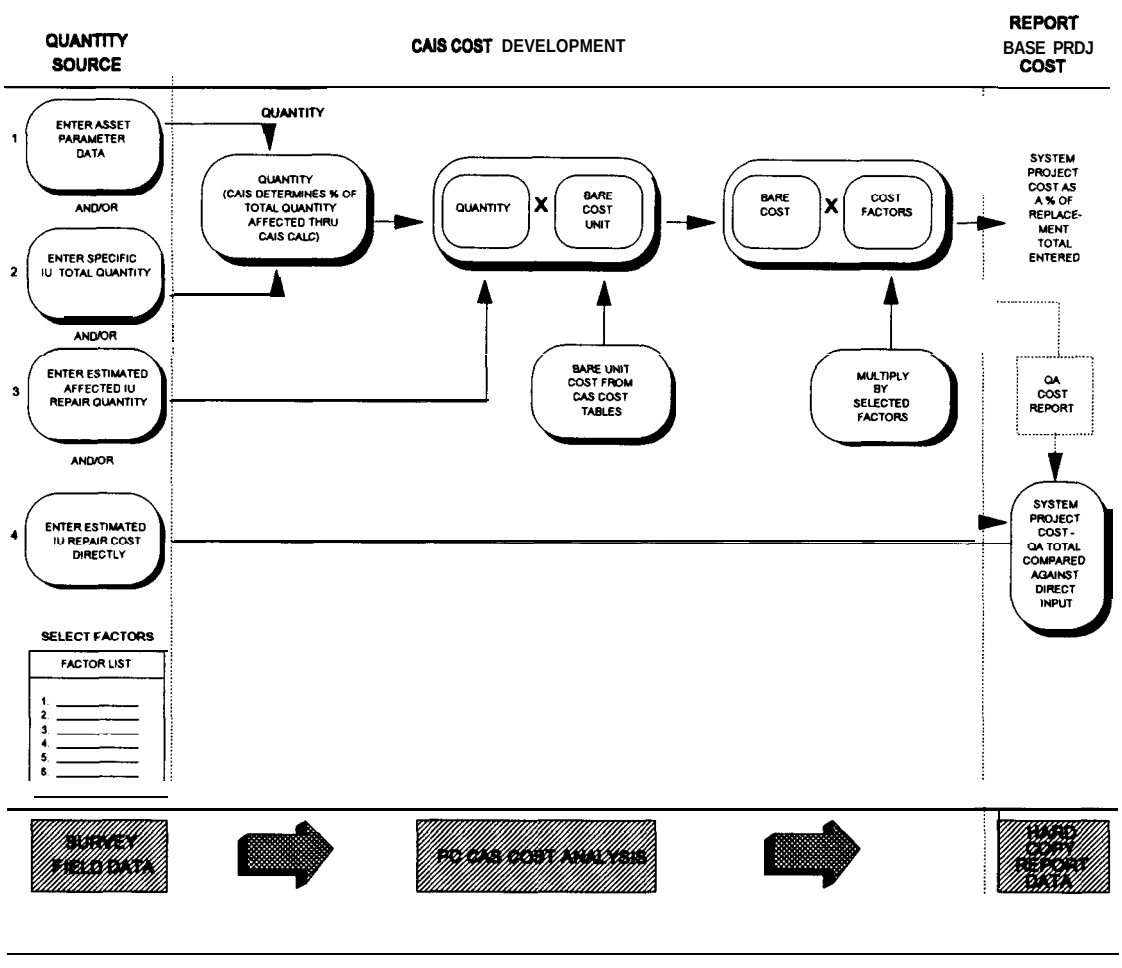
CONDITION CODE	**DEFINITION**
A	Excellent: Performs to original specifications as measured using non-standard tests; easily restorable to "like new" condition; only minimal routine maintenance required at cost <2% of replacement value.
B	Good: Performs to original specifications as measured using historical 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	Fail: Non-operational or significantly substandard performance. Replacement required because repair cost is >60% of replacement cost.

PURPOSE CODE*	**DEFINITION**
P2	PRG: Caoacitv
H2	H&S: Industrial Safetv
E2	ENV: Solid Waste Management
S4	S&S: Securitv
•	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.

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 0.11 Specialty Systems in addition to the Basic Tool Group outlined below.

The accomplishment of 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 and are identified in the guides.

All crafts involved in the inspection of Specialty Systems 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' measuring tape
- 3/8" drive socket set and ratchet
- 3x5 card stock for indicating photograph locations
- Aerosol can of bright colored paint
- Assorted center punches, drift punches, steel chisel
- Ball peen hammer
- Camera
- Claw hammer
- Crescent wrenches, 4" and 8"
- Emery cloth
- Extension cords and inspection lights
- File
- Grease guns and oilers
- Hack saw and spare blades
- High penetrating oil
- Level, 4 foot
- Metal square
- Open and box end wrenches, 1/4" & 3/8"
- Paint for marking deficiency locations
- Permanent black marker
- Pipe wrenches to 14"
- Pliers - vise grip (2), slip joint, needle-nose, diagonal, cutting pliers, side cutters
- Pocket knife
- 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

GUIDE SHEET TOOL & MATERIAL LISTING

NON-STANDARD TOOL GROUP

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

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 Specialty 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 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, test results will be recorded in the Data Collection Method.

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).

Standard vs Non-Standard

Inspection Methods are classified as Standard versus Non-Standard based on the 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 standard Guide Sheets. Where tests are indicated, they are non-invasive (e.g., Stress Monitor Analysis).

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

Some 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.

STANDARD TEST **METHODS**

- Fill Test

STANDARD TEST DESCRIPTION

Fill Test

If water is available for testing, the tank will be filled with water and inspected frequently during the filling operation.

If water is not available, the test may be made by painting all joints on the inside with a high penetrating oil and carefully examining the outside of the joints for leakage.

NON-STANDARD TEST **METHODS**

- Acoustic Emission Testing
- Borescope or Fiberscope
- Core Sampling
- Dye Penetrant
- Electrical Resistivity Testing
- Hydrostatic Testing
- Infrared Testing
- Magnetic Testing
- Microwave Absorption Scanning
- Nuclear Analysis
- Pick Test
- Radiography (X-ray Testing)
- Ultrasonic Pulse Velocity Testing
- Vacuum Box Testing

TESTING METHODS

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 maior drawback is that it can only be used during periods of high stress and deformations and does not work for static loading conditions.

Borescope or Fiberscope

This method involves instruments to view into materials, primarily masonry, to visually locate deficiencies such as cracks, spalls, or material deterioration. Using these instruments involves drilling or creating holes in the sample material, which require patching at completion.

Core Sampling

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

Dye Penetrant

Penetrant can be used to define the extent and size of surface flaws in steel members. Certain dyes have the ability to penetrate small surface cracks in materials. Examination, in some cases under ultraviolet light, is used to identify faults not otherwise visible. This method is particularly useful for stressed metals.

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, and may also determine the moisture content or moisture penetration of concrete surfaces. Even though this is a relatively simple test method, it is highly dependent on moisture and salt content and the temperature of the material.

Hydrostatic Testing

Hydrostatic testing involves using water under pressure to locate flaws and cracks in metal members and joints. Similar to Vacuum Box testing.

Infrared Testing

Infrared testing measures heat loss or gain. Areas of foundations and footings that absorb water will not insulate. Heat is lost more rapidly through these water-absorbing areas, and 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 method still 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 is 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.

TESTING METHODS

NON-STANDARD TEST DESCRIPTION (Continued)

Microwave Absorption Scanning

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

Nuclear Analysis

Nuclear analysis is accomplished using a mechanism that scatters neutrons on the foundation or footing. 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.

pick Tort

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, and a dull or hollow sound indicates decay or rot. This is not a very reliable test, so if decay is suspected, additional testing should be performed.

Radiogmphy (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. This method is seldom used for these building systems due to the cost, and dangerous equipment required. Conversely, testing with gamma rays is relatively portable and easier to use. The only limiting factor appears to be high cost, safety concerns, and the requirement to have access to both sides of a surface.

Ultrasonic **Pulse Velocity Testing**

Ultrasonic testing is performed 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 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 or masonry and measuring the travel time. This technique is excellent for establishing existing concrete or masonry uniformity and strength. It should be noted, however, that concrete conditions such as age, moisture, aggregate to cement ratio, aggregate type, and steel reinforcement placement location may adversely influence test results; and that a good coupling is required between the transducer and the test substrate.

Vacuum Box Testing

Vacuum Box testing is accomplished by painting all joints on the inside with a highly penetrating oil and applying vacuum to either side of the joints, and examining the outside of the joints for leakage.

TESTING METHODS

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 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 Specialty Systems assemblies and components.

TABLE ONE

Assembly/Component	Year One	Year Two	Year Three	Year Five
Canopies	S			
Loading Dock Systems	S			
Tanks		S		
Domes (Bulk Storage, Metal Framing)		S		
Louvers & Vents		S		
Access Floors	S			
Integrated Ceilings	S			
Mezzanine Structures	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 that determine the average "outside" time parameter a given System Assembly/Component will last. The Standard Design Life Tables that follow list 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

TABLE TWO

ITEM DESCRIPTION	Replacement Life, Years	Percent Replaced
0.11 SPECIALTY SYSTEMS		
CANOPIES	25	100
LOADING DOCKS	20	75
TANKS	30	loo
DOMES (Bulk Storage, Metal Framing)	40	100
LOUVERS &VENTS	20	100
ACCESS FLOORS	25	75
INTEGRATED CEILINGS	20	75
MEZZANINE STRUCTURES	35	100

END OF SUBSECTION

Source: Life Cycle Cost Data, Dell 'Isola and **Kirk**

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

0.11 SYSTEM ▪ SPECIALTY SYSTEMS

0.11 .01	CANOPIES
0.11.02	LOADING DOCK SYSTEMS
0.11.03	TANKS
0.11.03.01	Ground Level
0.11 .03.02	Buried
0.11.03.03	Elevated
0.11.04	DOMES (BULK STORAGE, METAL FRAMING)
0.11.05	LOUVERS &VENTS
0.11.06	ACCESS FLOORS
0.11.07	INTEGRATED CEILINGS
0.11.08	MEZZANINE STRUCTURES

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	LEVELS	0.08.01.01.01.01
NOT USED	TYPE	3/4" DIA. COPPER

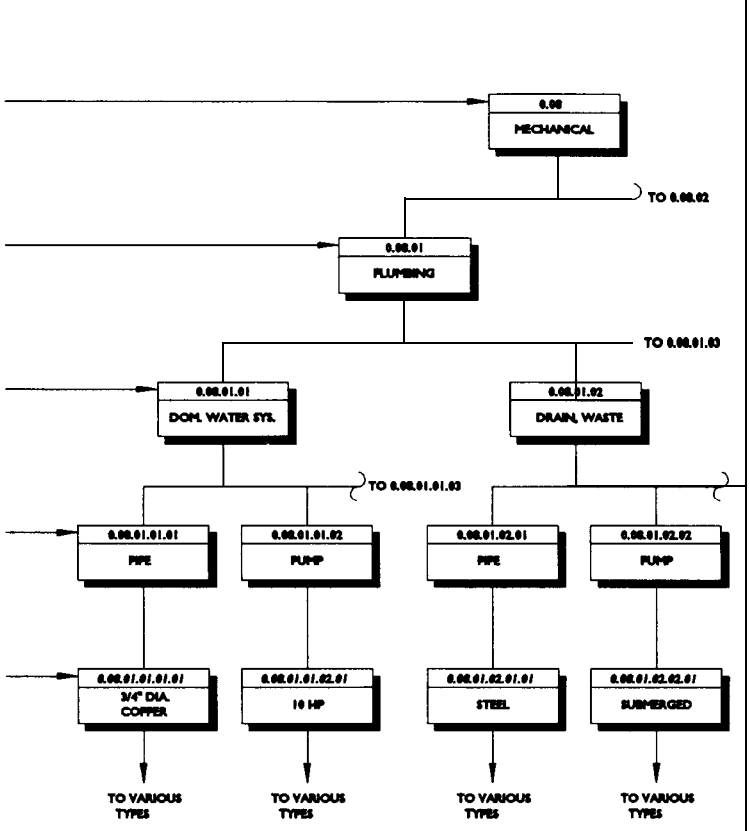


FIG. 1

SYSTEM WORK BREAKDOWN STRUCTURE

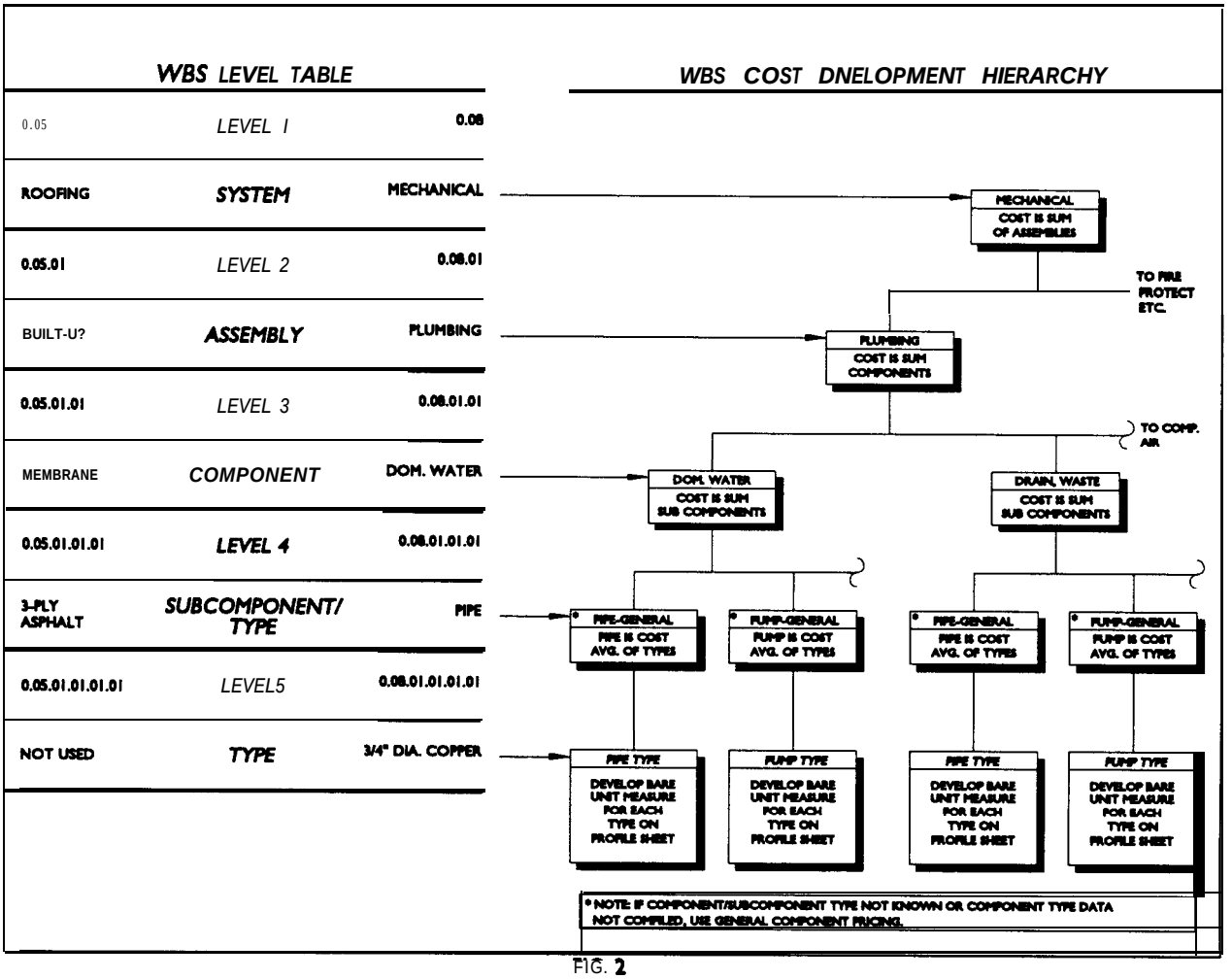


FIG. 2

END OF SUBSECTION

GENERAL SYSTEM/MATERIAL DATA

COMMON CAUSES OF CONCRETE DETERIORATION
(Similar for Pro-Cast Concrete1

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 design.
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 oeroendicular 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 some what 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 damage, 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 - "R.S. Means Co., Inc., Kingston, Massachusetts"

GENERAL SYSTEM/MATERIAL DATA

PRESERVATIVES — ADVANTAGES & DISADVANTAGES

Oil-Bared 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 Dainted: no objectionable odor.	Wood cannot be used in contact with around 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: **Means Facilities Maintenance Standards - "R.S. Means Co., Inc., Kingston, Massachusetts"**

GENERAL SYSTEM/MATERIAL DATA

Acetic Acid, all 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 or cracked moist concrete.
Ammonium **Bisulfate**	Disintegrates. In porous or cracked concrete, attacks steel.
Ammonium Carbonate	Not harmful.
Ammonium Cyanide	Disintegrates slowly.
Ammonium Fluoride	Disintegrates slowly.
Ammonium Nitrate	Disintegrates. In porous or cracked concrete, attacks steel.
Ammonium **Oxalate**	Not harmful.
Ammonium Sulfide	Disintegrates.
Ammonium Sulfite	Disintegrates.
Ammonium Superphosphate	Disintegrates. In porous or cracked concrete, attacks steel.
Ammonium **Thiosulfate**	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.
Butyl 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.
Cresol	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, hydrochloric 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.
Magnesium 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).
Perchlorlc Acid, 10 percent	Disintegrates.
Perchloro- Ethylene	Liquid loss by penetration.
petroleum **Oils**	Liquid loss by penetration. Fatty oils, if present, disintegrate slowly.
Phenanthnne	Liquid loss by penetration.
phenol, **5-25** percent	Disintegrates slowly.
Potassium Cyanide	Disintegrates slowly.
Potassium Dlthromate	Disintegrates.
Potassium Hydroxlde, **25** percent or over	Disintegrates concrete.
Potassium 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 **Bisulfite**	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 cracker 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 lhiosultate	Slowly disintegrates concrete of inadequate sulfate resistance.
Strontium Chloride	Not harmful.
Sulfite Liquor	Disintegrates.
Sulfite Solution	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 **(l)**	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).

0.11 .01 CANOPIES (CSI 10530)

DESCRIPTION

Canopies may be found at any location where there is a need for cover from inclement weather. They are made from a variety of materials such as sheet metal goods, fabric, glass/fiberglass, and wood. The structural system includes columns, beams, rafters, etc. and have the same framing and drainage system as roof structures. 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/COMPONENTS

Canopies (CSI 10530)

Canopy Fabric:

Eight generic fabrics are primarily used in today's canopies: acrylic-painted cotton, vinyl-coated polyester, acrylic-coated polyester, vinyl-laminated polyester, vinyl-coated poly-cotton blend solution dyed modacrylic, solution-dyed acrylic, and vinyl-coated cotton. All canopy fabric should be durable, able to withstand weathering, and be flame-retardant.

Framinn Svstem:

Framing systems for canopies are produced the same way as roofing systems. The size of the framework material and the amount of metal used is determined by the overall configuration of the canopy. As the canopy surface area increases, so must the size and strength of the framework system.

Current frame construction practices favor the use of either slip fittings or direct tube-to-tube welding. Slip fittings for framework are less rigid than if the framework were welded together, similar to the behaviour of two simple beams (in other words, the ends of the beams are not restrained from rotation at the ends). On the other hand, a fully-welded frame will behave structurally similar to a continuous beam over the same supports. It should be noted that the fully-welded frame will have less deflection and smaller bending stresses in the structure, resulting in greater efficiency.

Roof decks are composed of interlocking and self-flashing sections. The interlocking joints are fastened rigidly every 12 inches on-center except at the ends, where 8 inches on-center applies. The interlocking joint is fastened using spot welds, upset welds, rivets, or threaded devices. Roof deck spans are 15 feet or more and are assembled with wood members.

Expansion joints are designed for temperature changes of 120°F; they should not have metal-to-metal contact.

Anodized beams and columns are welded into one-piece rigid inserts at the factory or built as mechanical joints for fabrication at the job site. Extruded structural ties are rigidly installed on top of all beam sections and serve as closures between draining deck sections.

Framina Anchoring:

The most critical part of the canopy framing system is the anchor to the supports. The support is provided through the building structure or through some other framing method. The rational approach to this problem must involve the applicable building code to determine the structural loading.

0.11 .01 CANOPIES (CSI 105301

ASSOCIATED ASSEMBLY/COMPONENTS

Canopies (CSI 10530) (Continued)

Space Frames:

Known also as lattice structures or three-dimension trusses, space frames may be simply thought of as three-dimensional equivalents of the commonly used plane trusses. Some of their characteristics are described below.

- Nature of Members: A plane truss, roof or floor decking, and other elements should be arranged so that all loads are transferred to the truss joints. In that way, all truss members can act as two-force members. The members should theoretically have spherical (ball-and-socket) hinges at their ends, which is difficult in practice.
- Materials: Space frames can be built of reinforced concrete, or more typically, of steel or aluminum. If the joint problem is solved, space frames are feasible. To simplify construction, engineers tend to use uniform members. If all members are made of tubes with the same outside diameter, the wall thickness can be varied (although at considerable expense) to maintain uniform stresses in the material. Otherwise, the majority of members must be oversized so the most heavily loaded will not to be overstressed.
- Depth: The principal purpose of the depth of any structural assembly is to provide an adequate moment arm between the upper and lower edges. The space frame depths therefore correspond fairly closely to those of plane trusses under similar loadings. A single prismatic frame with heavy loads would require a depth of from 1/6 to 1/12 of the span. A complete floor system, however, with the top and bottom chords forming a two- or three-way grid similar to a system of closely spaced joists, would permit a minimum depth of 1/20 to 1/24 of the span.

There are two drainage systems: conventional and concealed. The conventional drainage system incorporates external components to direct water flow. Minimum roof slopes always ensure proper drainage to the fascia gutters. A concealed drainage system uses internal structural system components to direct water flow, which is then directed through the posts prior to being discharged through spouts at ground level.

Drainage may be accomplished by the following methods:

. Drain through spouts or outlets in the end of each beam. Water tails to ground from beam.
. Downspouts at the wall may be provided at draining beams. Water flows from deck, to beam, to downspout at wall, and is discharged to ground level or stormdrain.

Metal Canopies (CSI 10530)

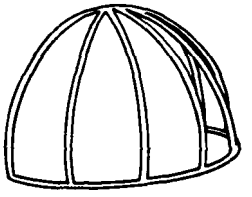
Metal canopy systems are similar to standard metal roofing systems. Metal roofing is durable, attractive, and can conform to a wide variety of roof shapes. Metals used for canopies include copper, aluminum, and terne plate. Terne plate is a steel sheet coated with lead and tin. Terne-coated stainless steel is also available. Other metals that are sometimes used include stainless steel, zinc, and lead. Stainless steel is expensive, but very durable and maintenance-free.

Finish..

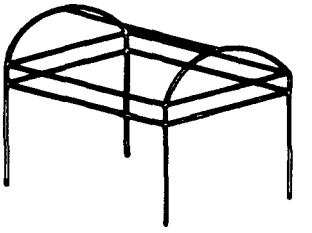
Finish on roof decks, posts, fascias, and gutters is either painted or anodized. Roof decks, fascias, and fascia gutters that are painted are finished with a baked-on polyester type enamel for durability and resistance to abrasion and fading.

OTHER RELATED COMPONENTS

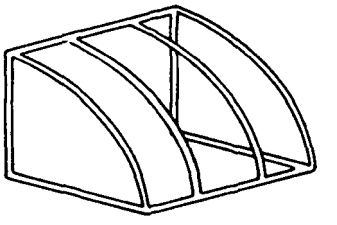
Refer to Superstructure, Exterior Closure, and Roofing, Volumes 3, 4, and 5, for additional deficiencies that may impact this system.



DOME



ENTRANCE CANOPY



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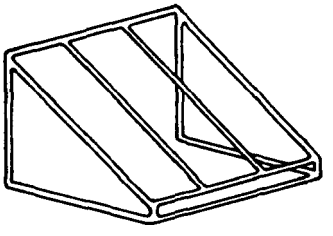
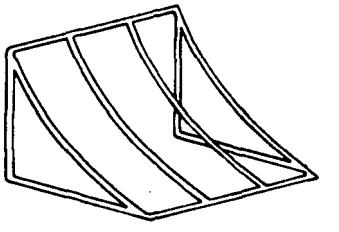


STANDARD STATIONARY



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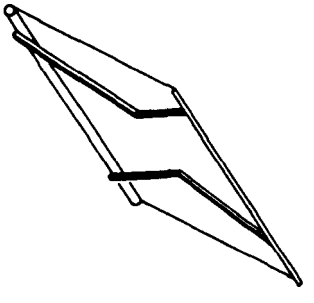

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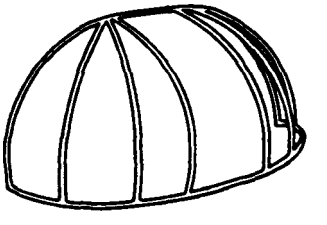

ELONGATED BULLNOSE

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	COMMON STYLES OF AWNINGS/CANOPIES		
CANOPIES (CSI 10530)	Revision No.	Issue Date 5/93	Drawing No. 81101-I

DEFICIENCY FACTORS
0.11 .01 CANOPIES (CSI 105301

PROBABLE FAILURE POINTS

- Loose, damaged, or missing fasteners.
- Roofing deterioration or structural collapses due to ponding water if insufficient slope to drainage is provided.
- Leaks caused by hardening and cracking of the neoprene fastener gaskets.
- Copper roof failure due to inadequate expansion and contraction allowance, particularly in flat seamed roofing.
- Rust or corrosion will eventually weaken or destroy the material if allowed to progress, leading to holes, punctures, and roof failure.
- Galvanic action between dissimilar metals, eg., aluminum and steel.

SYSTEM ASSEMBLIES/DEFICIENCIES

Material

Damaged or Missing Material/Pieces: Broken, cracked, split, or missing panels or tiles.

Corrosion/Rust:	Oxidation or eating away of a metal or other material by chemical or electrochemical action after prolonged exposure.
Holes/Punctures:	Holes or punctures in metal panels caused by missing fasteners, roof traffic, or corrosion.
Tears:	Tears in fabric caused by objects striking the canopy or excessive wear.
Open Seams:	Split or open seams on batten seam, flat seam, or standing seam joints.
Leaks:	Water penetration through metal roof panels, usually at joints or anchorage points.
Impact Damage:	Depressions, punctures, or buckled surface from objects striking the roof.
Metal Fatigue:	Loss of structural integrity and weakening of material from stress cracks, torquing, or bending.
Surface Deterioration:	Loss of protective coating or paint from environmental conditions or rust/corrosion.

Flashing

Damaged Base, Valley, & Counterflashing:	Bent, torn, punctured, separated flashing.
Missing Cap Flashing:	Missing cap flashing, exposing base flashing.
Deteriorated:	Eroded, weathered flashing exhibiting surface corrosion, holes, etc.

DEFICIENCY FACTORS
0.11 .OI CANOPIES (CSI 10530)

END OF SUBSECTION

0.11 .02 LOADING DOCK SYSTEMS (CSI 11160)

DESCRIPTION

Loading dock platforms are used to adjoin major shipping and receiving areas of a facility. They are usually built to the same height as the floor of the trucks or railway cars on which shipments are delivered to and from the dock. When loading docks are not equal in height with vehicles, dock levelers are incorporated into the loading dock system. Dock levelers are either mechanical, hydraulic, or fully automatic. 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/COMPONENTS

Dock Bumpers (CSI 11160)

Dock bumpers cushion the impact of forces and absorb the energy at impact, minimizing damage to the dock structure, the vehicle, and its contents. They are available in a variety of types and sizes. Selection of type, size, spacing, and pattern depend on the type of dock, dock height, frequency of use, and range of truck bed heights that can be expected. Other types of loading dock equipment to be installed will also affect the type and spacing of dock bumpers.

- Laminated rubber dock bumpers are the toughest, longest wearing rubber type and are available in a variety of lengths, heights, and depths. Unlike molded and extruded type bumpers, laminated bumpers with steel frames can be permanently and securely welded to steel angles or inserts embedded in the face of loading platforms. Replacing damaged parts is easier for this type of bumper.
- Molded rubber dock bumpers are cleaner and neater in appearance than the laminated type and may be more weather resistant. They are not available in as wide a variety of thicknesses and sizes as the laminated type, but a selection of different shapes may be considered.
- Extruded rubber dock bumpers are used for greater cushioning. They are not suitable for heavy duty.
- Flexible steel dock bumpers are similar in function to rubber bumpers, but are based on the leaf-spring type shock absorber found in automobiles. These bumpers flex and absorb the shock on impact, but recoil and return to their original shape when the truck departs. Because they are steel rather than rubber, the possibility of permanent damage to the bumper is significantly reduced. Because they can be installed to project above the level of the dock, they are more flexible regarding the location of installation, and can protect docks of many different heights.

Dock Levelers (CSI 11160)

Dock levelers are available in mechanical, hydraulic, and fully automatic models. The type selected depends on the individual circumstances, including factors such as frequency of use and dock size. A secondary, but often important, function of dock levelers is to allow fork lift trucks to remove end loads from truck beds that are below the level of the loading platform. The leveler should have the ability to lower the ramp with the lip retracted and is offered on most units.

Recessed, hinged-lip dock levelers are for permanent installation in loading dock platforms. The proper size and type of leveler is an important part of an overall analysis of the entire loading dock operation, including possible truck sizes and configurations, platform and loading berth layout, dock depth, frequency of use, size and types of loads, type of material handling equipment, safety, and security.

0.11.02 LOADING DOCK SYSTEMS (CSI 11160)

ASSOCIATED ASSEMBLY/COMPONENTS (Continued)

Dock levelers are designed to fulfill three critical functions:

- Bridge gaps between the end of the truck and the edge of the loading platform with a hinged lip that extends and retracts.
- Overcome differences in height between the truck bed and the loading platform with a rising and descending ramp.
- Permit the efficient and safe transfer of freight between the truck and the loading platform. (Choose equipment of the proper capacity, function, and operation to fulfill this requirement.)

Mechanically operated dock levelers employ a spring counterbalancing mechanism, which either acts to assist the operator in lifting the ramp by offsetting part of its weight, or provides the entire lifting force needed to raise the ramp to the top of its operating range.

Principal differences in operation occur in the areas of lip extension and cross-traffic support.

- Lip Extension. In mechanically and hydraulically operated levelers, the lip does not extend until the beginning of the walk-down phase. In other mechanically operated units' free falls are prevented by a hydraulic velocity fuse connected to the main hydraulic lift cylinder.

Hydraulic Dock Lifts (CSI 11160)

Hydraulic dock lifts, sometimes called scissor lifts, offer a different approach to compensate for the differences between the dock level and truck bed. This type of unit raises and lowers a platform hydraulically in a level plane. These units are extremely rugged and because of the nature of their design, are much more versatile. An hydraulic dock lift is the only item of loading dock equipment that is able to service all types of vehicles and still provide flexibility for different truck bed heights.

Hydraulic dock lifts are available in several types and configurations from portable and semi-portable types to the high-lifting double- or triple-scissor types. They can be installed outside, in a pit, on the pavement, in the face of a loading dock, or they may be installed inside a facility where a change of level is necessary. Hydraulic lifts are available with platform sizes up to 8 x 12 feet and in capacities up to 30,000 pounds. Consult with the manufacturer of the lifts under consideration for use in the project before finalizing the design.

Dock Seals (CSI 11160)

Dock seals form an air-tight seal between the truck and the building and are therefore an important energy-conserving device. They are particularly needed for critical applications such as loading docks on refrigerated warehouses, frozen food processing plants, meat lockers, and similar low-temperature applications.

Fabric Abrasion Resistance:

One of the principal considerations in pad construction is its ability to withstand the abrading action caused by the pitching and rolling motion of the truck during loading and unloading. This promotes special fabrics that are stronger and more durable.

Dock Shelters (CSI 11160)

Dock shelters are used when the following conditions make other solutions ineffective:

- Doors with opening sizes so much wider than the rear of the truck body that even beveled door seals cannot form an effective seal with the back of the truck.
- Loading platforms or ledges that project too deeply from the face of the doors to be closed by dock seals.

0.11.02 LOADING DOCK SYSTEMS (CSI 11160)

ASSOCIATED ASSEMBLY/COMPONENTS

Dock Shelters (CSI 11160) (Continued)

- Loading operations where complete access to the rear of the truck is necessary.
- Locations where a wide variety of vehicle heights are serviced.
- Where building walls cannot **support** the pressures imposed against them by dock seals.

Transparent Strip Door Curtains (CSI 11160)

Transparent strip door curtains are frequently used as an energy-saving device on loading dock facilities. They effectively seal large openings against the effects of weather and temperature, and at the same time, permit easy penetration for fork lifts and pedestrian traffic. They part easily on contact, return automatically to the closed position, and require no energy for operation. These curtains also control the amount of exterior dust and dirt that enters a facility, leading to increased cleanliness and lower maintenance costs. They are made of transparent strips of PVC. As a result, even though the view is somewhat distorted because of the shape of the strips, it is possible to see through them and know when a delivery is coming. They are also an effective sound barrier.

OTHER RELATED COMPONENTS

Refer to Foundation and Footings, Substructure, and Exterior Closures, Volumes 1, 2, and 4, for additional deficiencies that may impact this system.

0.11.02 LOADING DOCK SYSTEMS (CSI 11160)

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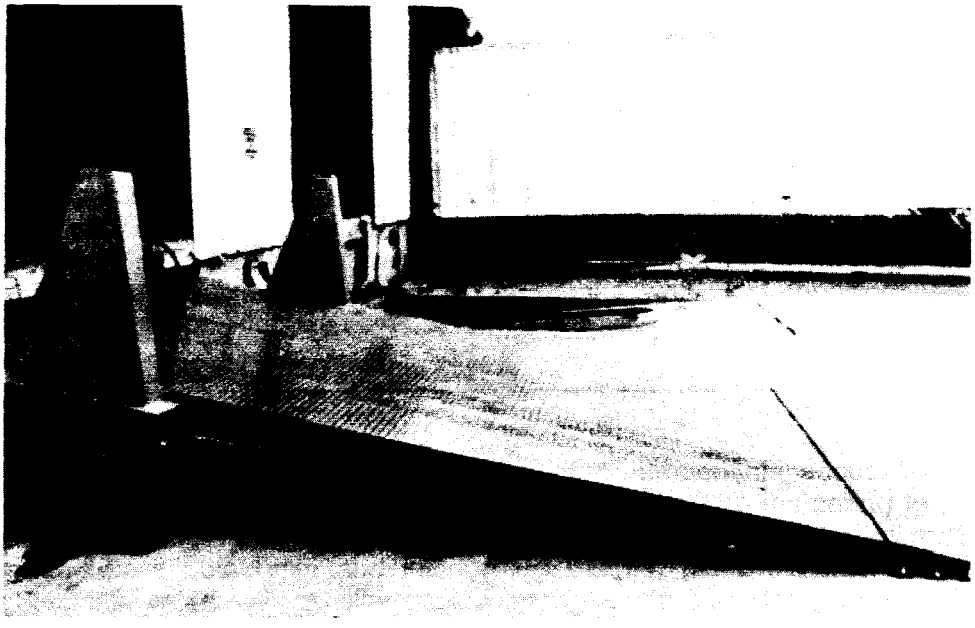
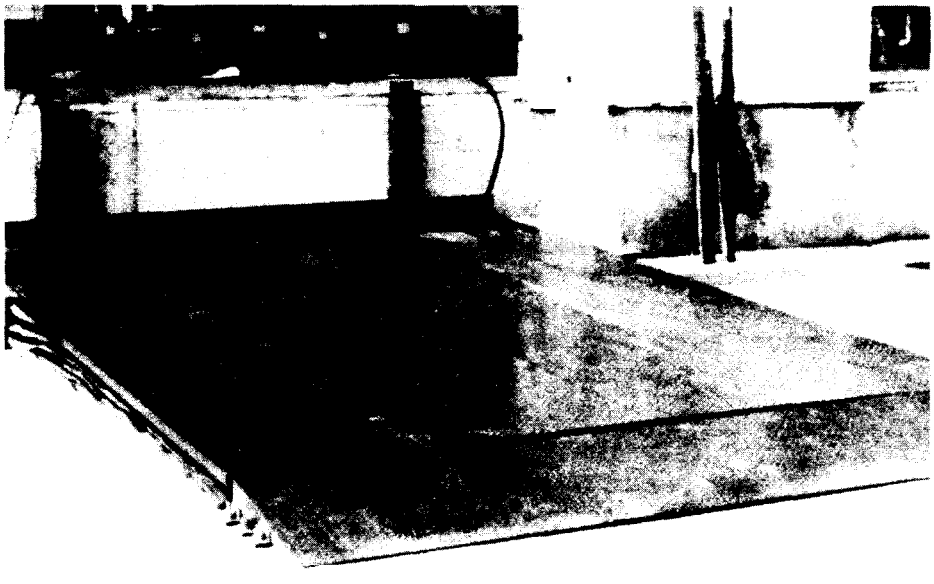
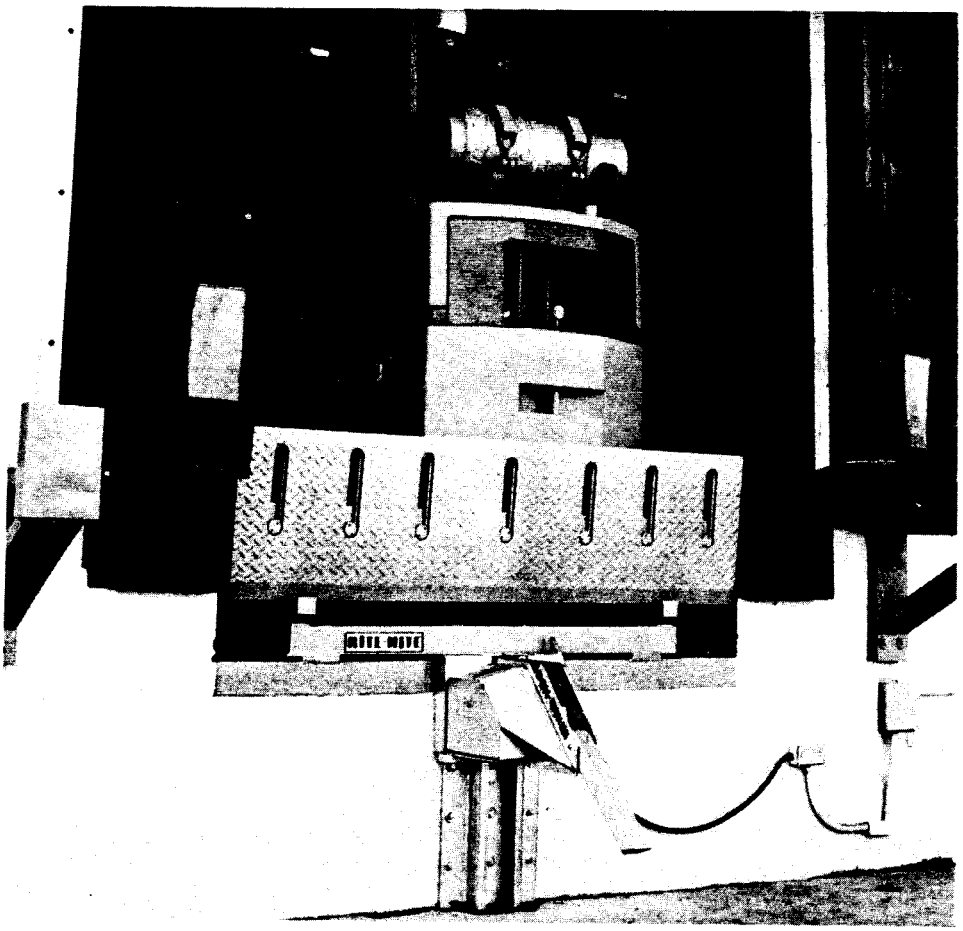




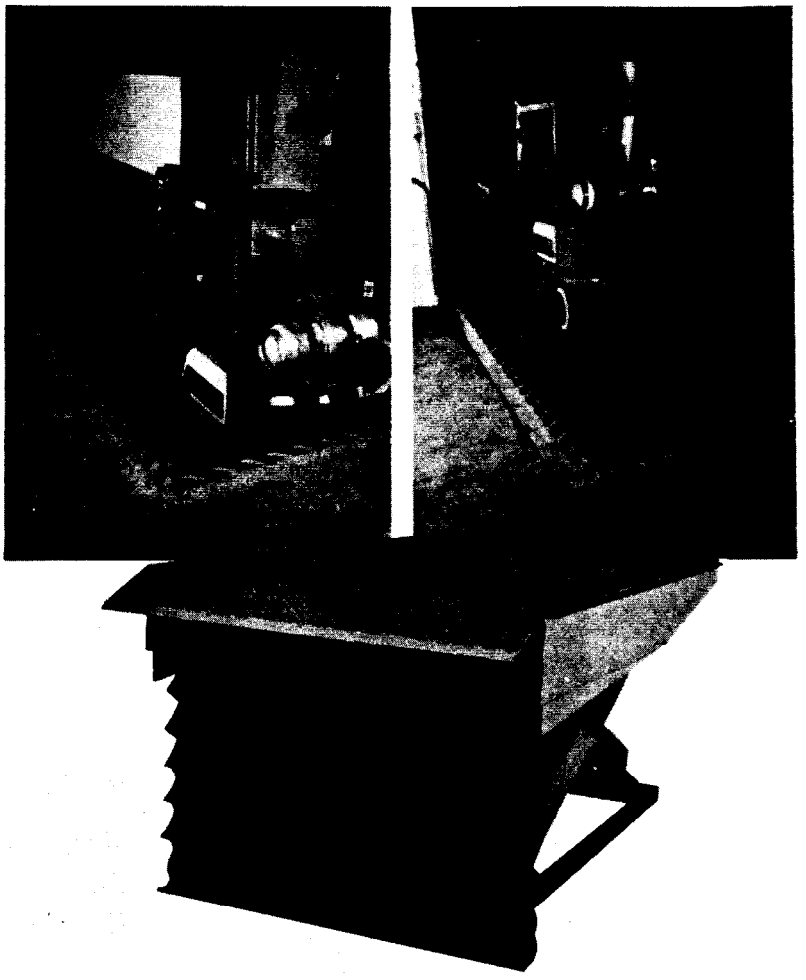
SOURCE: AUTOQUIP CORPORATION. 1989 SWEET'S CATALOG

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	SURFACE MOUNTED LEVELER		
LOADING DOCK SYSTEMS (CSI 11161)	Revision No.	Issue Date 5/93	Drawing No. A1102-1



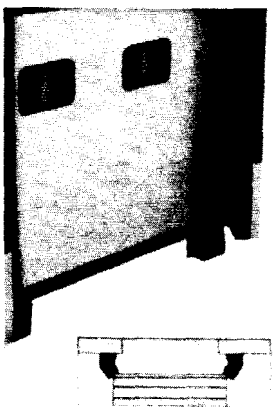
SOURCE: USED WITH PERMISSION OF THE RITE HITE CORPORATION

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	HYDRAULIC DOCK LEVELER		
LOADING DOCK SYSTEMS (CSI 11161)	Revision No.	Issue Date	Drawing No.
		5/93	A1102-2

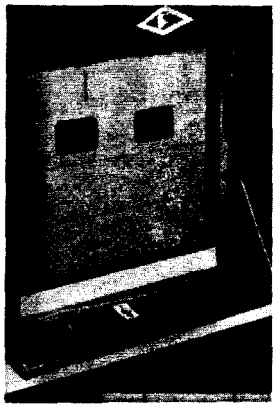


SOURCE: USED WITH PERMISSION OF THE RITE HITE CORPORATION

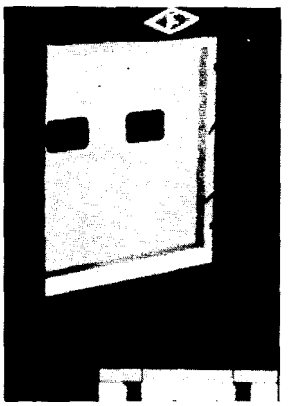
SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	PIT INSTALLED DOCK LIFT		
LOADING DOCK SYSTEMS (CSI 11162)	Revision No.	Issue Date 5/93	Drawing No. A1102-3



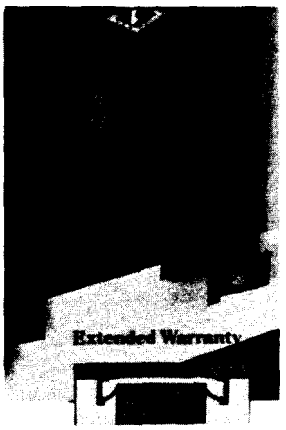
WEDGE SEAT



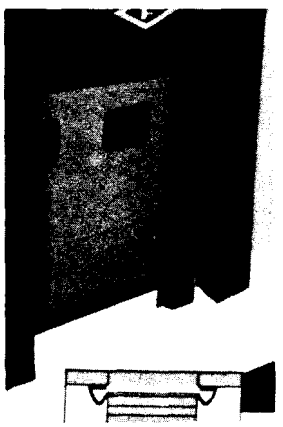
FLEXIBLE RAIL SHELTERS



INFLATABLE RAIL SEAL



RIGID SHELTER



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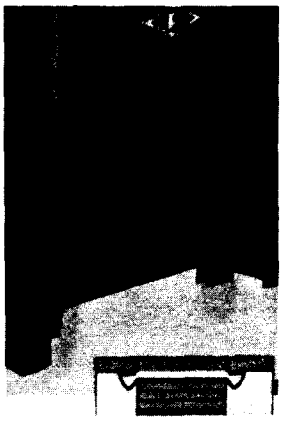
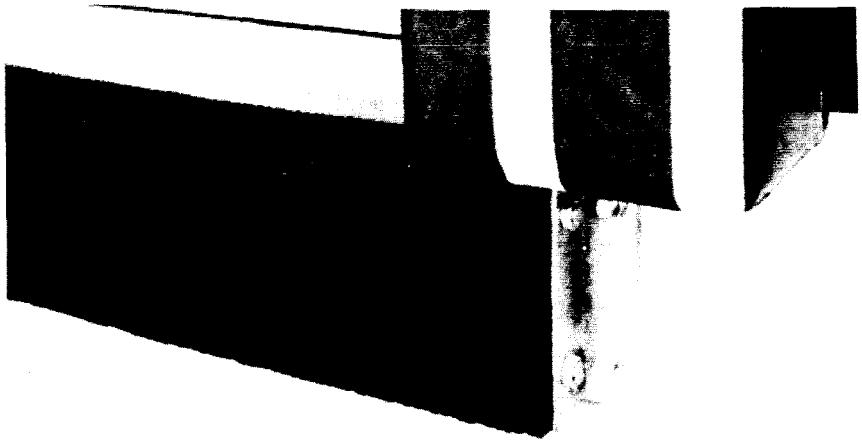
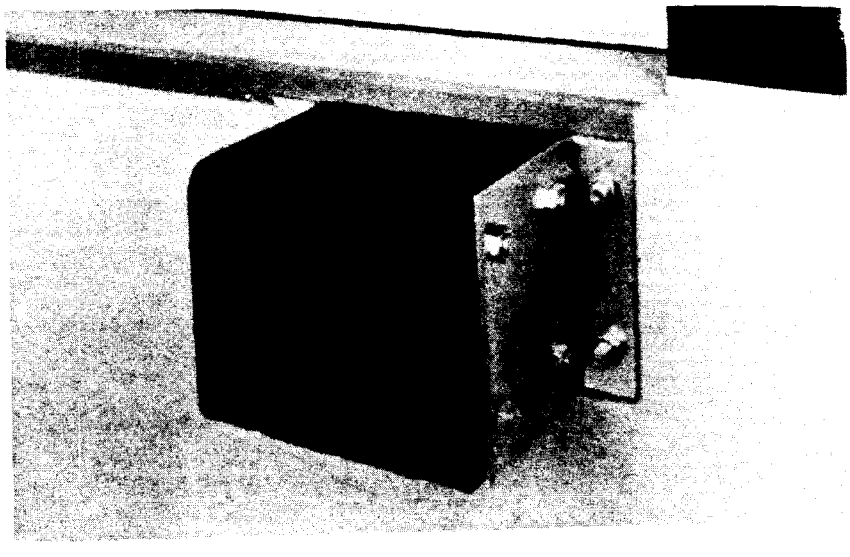


FLEXABLE SHELTER

SOURCE: USED WITH PERMISSION OF THE RITE HITE CORPORATION

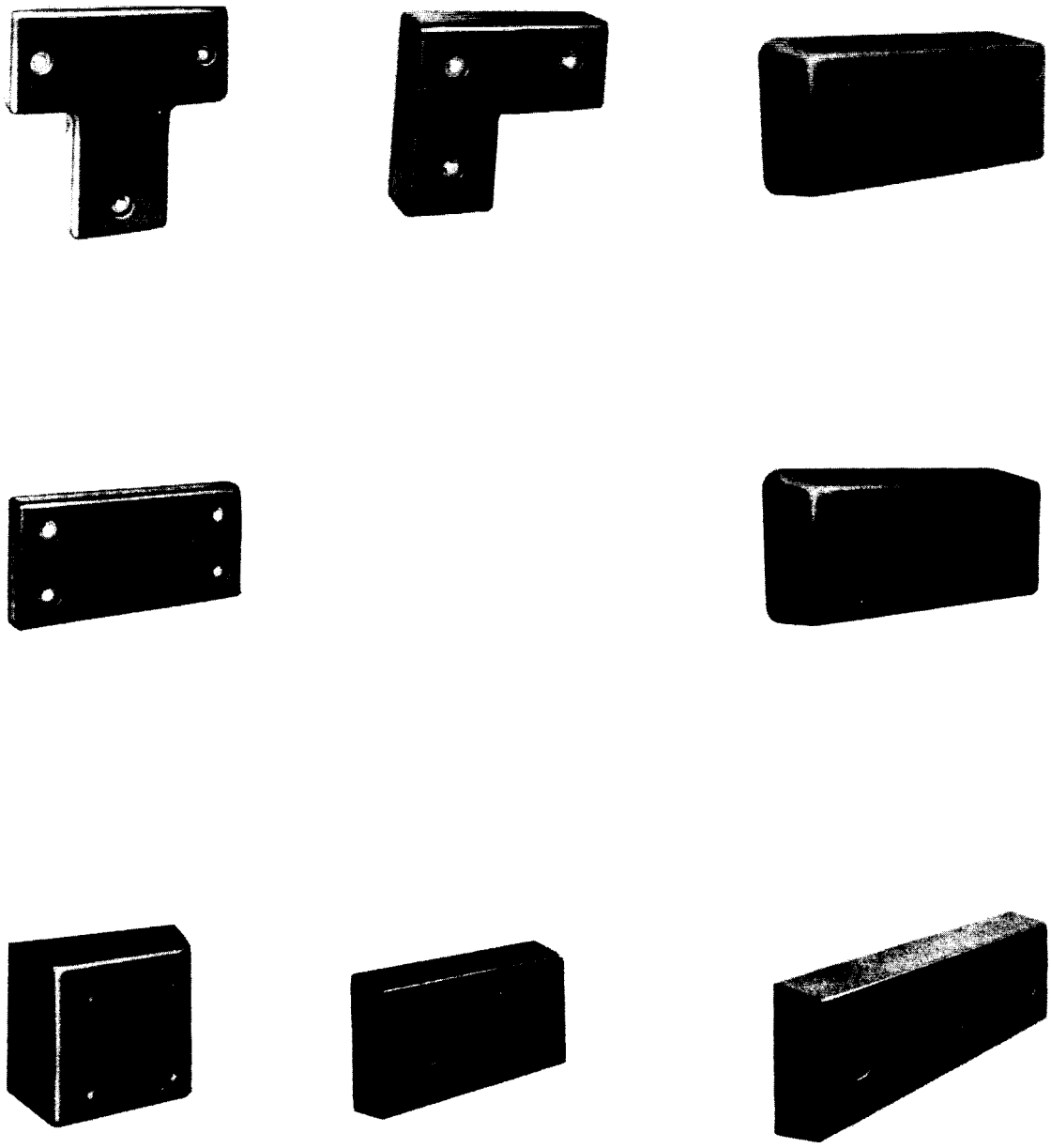
SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	LOADING DOCK SEALS		
LOADING DOCK SYSTEMS (CSI 11164)	Revision No.	issue Date 5/93	Drawing No. A1102-4





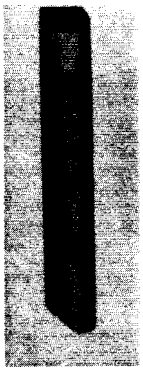
SOURCE: DURABLE MAT COMPANY. 1989 SWEET'S CATALOG

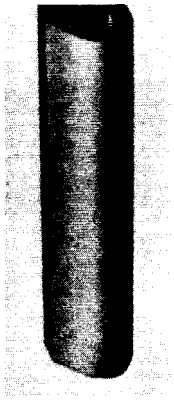
SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	LAMINATED RUBBER DOCK BUMPERS		
LOADING DOCK SYSTEMS (CSI 11165)	Revision No.	issue Date 5/93	Drawing No. A1102-5

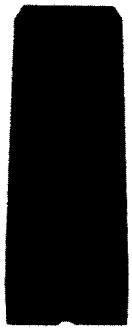


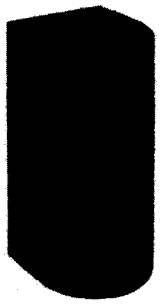
SOURCE: DURABLE MAT COMPANY, 1989 SWEET'S CATALOG

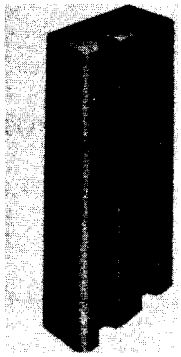
SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	MOLDED DOCK BUMPERS		
LOADING DOCK SYSTEMS (CSI 11165)	Revision No.	Issue Date 5/93	Drawing No. A1102-6





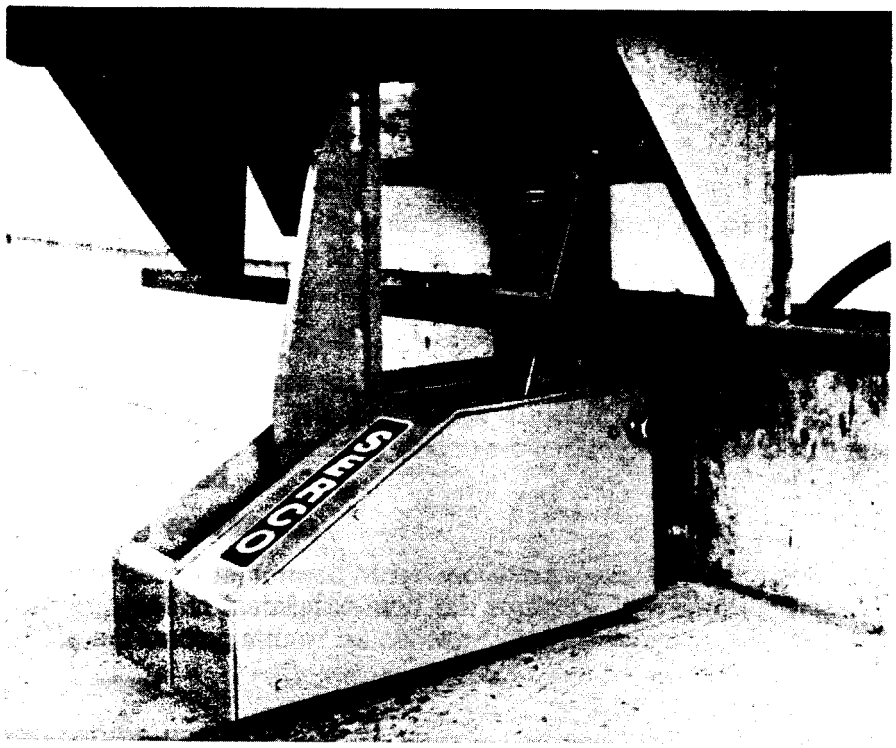






SOURCE: DURABLE MAT COMPANY. 1989 SWEET'S CATALOG

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	EXTRUDED DOCK BUMPERS		
LOADING DOCK SYSTEMS (CSI 11165)	Revision No.	Issue Date 5/93	Drawing No. A1102-7



AUTOMATIC TRUCK RESTRAINT SYSTEM

SOURCE: SERCO LOADING DOCK EQUIPMENT. 1989 SWEET'S CATALOG

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL RESTRAINT SYSTEM		
LOADING DOCK SYSTEMS (CSI 11160)	Revision No.	Issue Date 5/93	Drawing No. A1102-8

DEFICIENCY FACTORS
0.1 **1.02** LOADING DOCK SYSTEMS **(CSI 11160)**

PROBABLE FAILURE POINTS

- Damaged dock leveler, rendering dock inoperable.
- Faulty dock leveler equipment caused by excessive usage, jammed devices, equipment corrosion.
- Loose connections caused by vibration, temperature changes, or improper tightness.
- Cracking caused by stress, settlement/movement, poor materials, or improper construction.
- Impact damage caused by objects striking or impacting the surface.
- Excessive overloads induced during unloading and loading severe enough to shorten loading dock lifetime.
- Errors in design and detailing ranging from poor appearance to lack of serviceability.
- Deleterious chemical reactions resulting in loading dock deterioration due to the aggregate used or materials that come into contact with chemicals.

SYSTEM ASSEMBLIES/DEFICIENCIES

Staining:	Surface discoloration from a foreign substance or material.
Efflorescence:	A whitish powdery deposit of soluble salts brought to the surface by moisture which leaves a residue after evaporating.
Damaged/Missing Sections:	Broken, damaged, cracked, or missing dock bumpers.
Corrosion:	Corrosion of steel shelf angle.
Cracks:	Settlement, inadequate finishing/curing, stress concentration, structural design, excessive overload, fatigue, and earthquake.
Spalling:	Fragments flake from the surface due to pressure.
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 Pieces:	Misuse, excessive wear/tear, problems with operable motors.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the door or bumper surface.

DEFICIENCY FACTORS
0.11.02 LOADING DOCK SYSTEMS (CSI 11160)

END OF SUBSECTION

0.11.03 TANKS (CSI 15000)

TANKS (CSI 15000)

Refer to Mechanical, Volume 8 for deficiencies that relate to Compressed Gas Storage Tanks, Storage Tanks, Tanks and Sumps, and Condensate Return Tanks.

0.11.03 TANKS (CSI 15000)

END OF SUBSECTION

0.11.04 DOMES (BULK STORAGE, METAL FRAMING) (CSI 13132)

DESCRIPTION

Domes are one of the most efficient structural systems known because the shape of the structure itself helps resist loads. There are three basic variations of domes: the frame dome, the geodesic dome, and the thin shell dome. Bulk storage domes are of two types: prefabricated and pre-engineered. These storage systems are built to handle 500 to more than 100,000 tons of product. 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/COMPONENTS

Domes (CSI 13132)

Domes are generally built on some variation of the radial curve principle. Rolled steel sections are most commonly used because the depths of section needed can easily be found in standard sizes. As straight members they form a polyhedron. Length of members are typically in the range of 15 to 25 feet, which determines the spacing of radial and parallel ribs. (Bulk storage domes have large entrance canopies that allow trucks to drive inside and a vast clear-span, unobstructed interior that ensures easy loading and unloading operations.)

Triangulated metal-frame domes work as diaphragms and are suited to withstand loading conditions:

- The geodesic dome structure produces exceptional rigidity from its combination of many, relatively short structural members.
- The lamella dome, also triangulated, is not as material efficient as the geodesic because it uses longer, heavier structural members.

The radial arched dome is not triangulate, but rather a system of arches intersecting at midspan and reinforced with “hoops” around its circumference. Because its structural design is more conventional, consideration of lateral loading is more important.

The triangulated metal dome can be framed with members of varying lengths connected to form a uniform surface:

- The single layer dome uses structural elements solely at the dome surface and can span up to 150 feet.
- The double layer dome uses a framing layer within the sphere with web members connecting to the outer layer. The structure resembles that of a sphere frame and is used for long spans over 120 feet.
- Geodesic domes on round, pentagonal, and hexagonal bases with spans well over 200 feet are commercially available.

The radial arched dome is formed by intersecting arches of the same diameter and is more limited in clear span capability up to 50 feet maximum.

Foundation & Retaining Wall:

The foundations of bulk storage domes are floating mat foundations as per BOCA Code 1205.3 consisting of a minimum of 4 inches of bituminous concrete over a minimum of 6 inches of well-compacted crushed stone. Soil support is a minimum of 2,000 Ibs per sq ft before placement of crushed stone. The finished surface of the floating mat foundation is plus/minus 1 inch of level.

0.11.04 DOMES (BULK STORAGE. METAL FRAMING) **(CSI 13132)**

ASSOCIATED ASSEMBLY/COMPONENTS

Foundation & Retaining Wall (Continued):

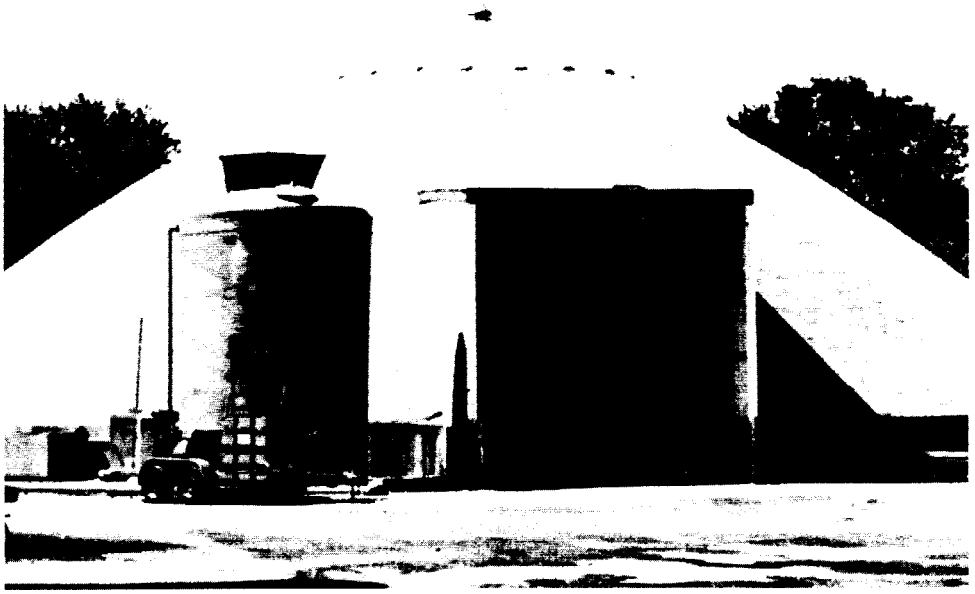
The retaining wall is a reinforced concrete tension ring, one foot thick, designed to withstand the pressure of the stored material and the dome structure's dead or live loads. The retaining wall sits on the floating mat foundation. After curing, the inside of the retaining wall is coated with two applications of a mixture of 50% mineral spirits and 50% linseed oil.

Roofing:

The roofing material is standard asphalt roofing shingles with either fiberglass or organic mat. The shingles are normally installed over a 15 lb roofing felt. On areas with a slope of less than 12 degrees, roll roofing is used.

OTHER RELATED COMPONENTS

Refer to Substructure, Exterior Closure, and Roofing, Volumes 3, 4, and 5, for additional deficiencies that may impact this system.



SOURCE: DOME CORPORATION OF AMERICA

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL DOMED STORAGE FACILITY		
DOMES (CSI 13025)	Revision No.	Issue Date 5/93	Drawing No. A1104-1

REVIEW PENDING

REVIEW PENDING

REVIEW PENDING

REVIEW PENDING

SOURCE: DOME CORPORATION OF AMERICA

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL DOMED STORAGE FACILITY		
DOMES (CSI 13025)	Revision No.	issue Date 5/93	Drawing No. A1104-2

DEFICIENCY FACTORS
0.11.04 DOMES, (BULK STORAGE, METAL FRAMING) (CSI 13132)

PROBABLE FAILURE POINTS

- Loose, damaged, or missing fasteners.
- Roof deterioration or structural collapses due to ponding water when insufficient slope to drainage is provided.
- Cracking or dried out and missing joint sealants.
- Leaks caused by hardening and cracking of the neoprene fastener gaskets.
- Damaged or missing flashing resulting in leaks.
- Copper roof due to inadequate expansion and contraction allowance, particularly in flat seamed roofing.
- Rust or corrosion eventually weakens or destroys the material if allowed to progress, leading to holes, punctures, and roof failure.
- Galvanic action between dissimilar metals; eg., aluminum and steel.

SYSTEM ASSEMBLY/DEFICIENCIES

Material

Joint Material Dried Out/Missing:	Loss of proper watertight seal due to cracking or missing sections of joint material or sealants caused by aging and environmental factors.
Damaged or Missing Material/Pieces:	Broken, cracked, split, or missing panels or tiles.
Corrosion/Rust:	Oxidation or eating away of a metal or other material by chemical or electrochemical action after prolonged exposure.
Holes/Punctures:	Holes or punctures in domes caused by missing fasteners or corrosion.
Open Seams:	Split or open seams on batten seam, flat seam, or standing seam joints.
Leaks:	Water penetration through metal roof panels or tiles usually found at joints or anchorage points.
Metal Fatigue:	Loss of structural integrity and weakening of material from stress cracks, torquing, or bending.
Surface Deterioration:	Loss of protective coating or paint from environmental conditions or rust/corrosion.
Impact Damage/Denting:	Impact depressions on the unit frame or curb.
Loss of Protective Coating/Paints:	Surface deterioration due to loss of protective coatings or paints. Signs of loss include cracking, chalking, and flaking.

DEFICIENCY FACTORS
0.11.04 DOMES, (BULK STORAGE, METAL FRAMING) (CSI 13132)

SYSTEM ASSEMBLIES/DEFICIENCIES (Continued)

Flashing

Damaged Base, Valley & Counterflashing:	Bent, torn, punctured, separated flashing.
Missing Cap Flashing:	Missing cap flashing, exposing base flashing.
Deteriorated:	Eroded weathering flashing, exhibiting surface corrosion, holes, etc.

END OF SUBSECTION

0.11.05 LOUVERS & VENTS (CSI 10200)

DESCRIPTION

A wide array of different louver configurations is available to satisfy a variety of needs including those relating to visual concerns; weather resistance; durability; structural performance under wind, snow, and seismic loads; airborne sound transmission loss; and air performance. 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/COMPONENTS

Screens (CSI 11190)

Screens have a wide selection of wire materials and mesh sizes. Bird screens are used where louvers are exposed to flying objects, vandalism, or abuse. Insect screens are used with caution and only where other means of insect exclusion, such as filters in air handling equipment, are absent. The small openings between wires become easily clogged and are readily damaged, which can obstruct optimum airflow. Generally, screens are visually objectionable on the exterior louver face, which more often than not, is the best location for maintenance and minimizing clogging.

For adjustable louvers, screens are located on the exterior to avoid interfering with projecting operating linkage, unless operating bars and arms are concealed in frames. Exterior mounted screen seals prevent rotational interferences caused by nests of bees, birds, etc.

Finishes (CSI 09900)

General:

Louvers are rarely offered with mechanical finishes for several reasons. Of primary importance is applying finishes to convoluted surfaces of louver frames and blades, where louvers are made of aluminum and are indicated to receive a caustic etch. This process in itself will remove enough metal, including mechanically produced textures, to produce a surface of satisfactory appearance.

Aluminum Finishes:

Aluminum finishes are clear and color anodized, baked enamel, and high performance organic coatings. For field-painted louvers, conversion-coated finishes (unprimed) could be inserted, but will tend to lose their good paint-holding qualities with time and must receive prime and finish coats of paint after factory finishing is completed.

Formed Galvanized Steel Sheet Finishes:

Plain and galvanized sheet steel louvers are generally furnished either with mill finish; factory-primed finish for field painting, or factory-applied baked enamel finish.

Louver Construction:

Aluminum extrusions are formed by aluminum sheets. Galvanized steel sheets are the most commonly used materials for louver blades and frames. Louvers combine blades of formed aluminum sheet with frames of extruded aluminum. Metals such as copper, lead-coated copper, brass, bronze, etc., are provided as long as they can be properly formed and welded. Aluminum has been a popular choice for louvers because of its good appearance and corrosion resistance.

0.11.05 LOUVERS & VENTS (CSI 10200)

ASSOCIATED ASSEMBLY/COMPONENTS

Fixed Louvers (CSI 10200)

Louver Blade Confiaurations:

Drainable blade louvers combine effective water penetration resistance with comparatively low air resistance. However, water penetration resistance will deteriorate if dirt and debris are allowed to collect in blade gutters and block drainage paths.

All fixed louvers, no matter how designed, will permit water penetration to some extent and will vary depending on exterior wind velocities and louver function. Free area by itself, is inadequate in predicting the volume of air that can pass through a louver at a given velocity. The static pressure drop, which is a function of a blade's air resistance, must also be known.

Adjustable Louvers (CSI 10200)

Adjustable louvers contain blades that rotate within the louver frame between fully open at a preset angle, and fully closed. Adjustable louver blades for adjustable units are available in most of the same profiles provided for fixed louvers.

Blades are operated either manually by cranks, pushbars, or chains, or by electric, pneumatic, or hydraulic-powered devices (actuators). Location and function of adjustable louvers will generally dictate type of operation required. Hand-operated units with push bars or chains may also be provided with fusible links and springs for automatic closing or opening in the event of fire. Crank operators with operating linkage concealed in frames are available with removable or permanent crank handles, Motorized units may be set up for individual louvers, either with motors and linkage concealed in frames or surface-mounted in a variety of positions; or for several louver sections mounted in tiers or sections with tandem operation.

Brick/Block Vents (CSI 04200)

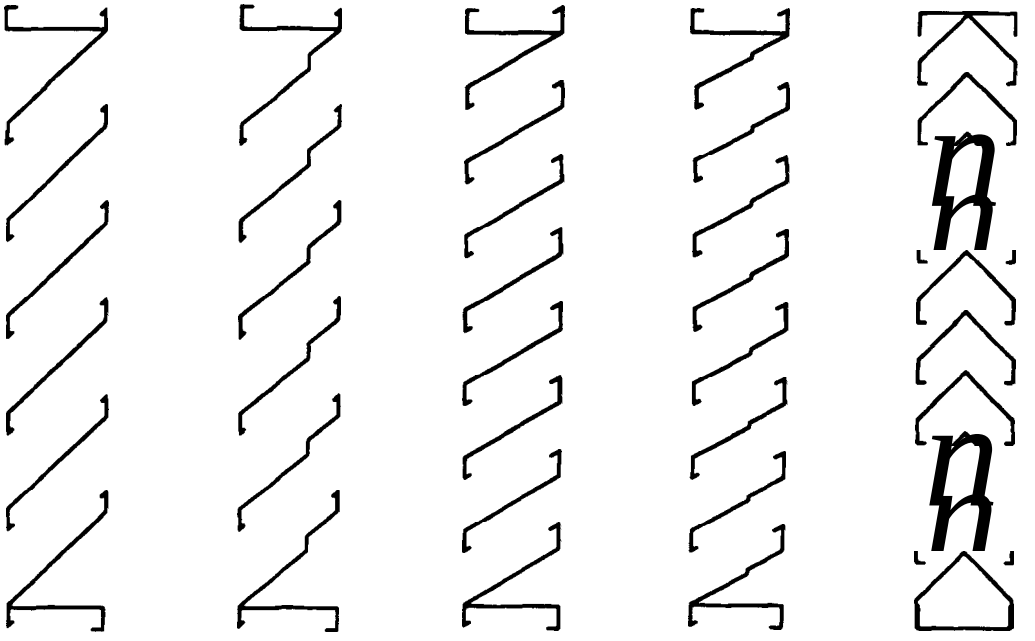
Brick/block vents are louvered wall ventilators built into exterior walls in the form of hollow metal aluminum castings made in standard brick size. They are made the width of one to three standard bricks and the height of one to three standard bricks.

The vent face is louvered and has water drips top and bottom to prevent water from entering the vent. A mesh insect screen is placed directly behind the louvers.

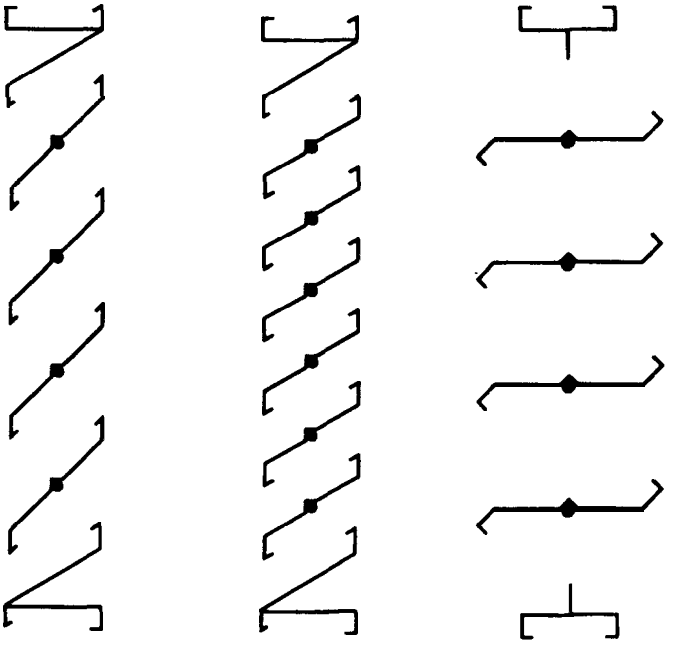
Brick/block vents provide a permanent means of ventilation for crawl spaces, foundations, hung ceilings, incinerator rooms, chimney flues, pipe spaces, and corridors.

OTHER RELATED COMPONENTS

Refer to Exterior Closure and Interior Finishes and Construction, Volumes 4 and 6, for additional deficiencies that may impact this system.



STATIONARY



ADJUSTABLE

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL LOUVER STYLES		
LOUVERS AND VENTS (CSI 10210)	Revision No.	Issue Date 5/93	Drawing No. A1105-1

DEFICIENCY FACTORS
0.11.05 LOUVERS & VENTS (CSI 10200)

PROBABLE FAILURE POINTS

- Leakage loss caused by loose, warped surfaces, broken joints, and poor connections.
- Accumulation of foreign matter, such as dirt, grime, and oil or water vapor condensation.
- Metal corrosion caused by an electrochemical process that occurs in the presence of air and moisture.
- Loose connections caused by vibration or improper tightness.
- Impact damage caused by objects striking or impacting the surface.

SYSTEM ASSEMBLY/DEFICIENCIES

Loss of Protective Coating/Paint:	Chalking, peeling, chipping, blistering, or deterioration.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Loose Connections:	Impact, vibration, or incorrect tightness.
Missing Louvers/Vents:	Corrosion of supporting accessories.
Corrosion:	Resulting from a chemical or electro-chemical reaction that converts the metal into an oxide, carbonate, and/or sulfide.
Damaged/Inoperable Hardware:	Excessive wear,

DEFICIENCY FACTORS
0.11.05 LOUVERS & VENTS (CSI 10200)

END OF SUBSECTION

0.1 1.06 ACCESS FLOORS (CSI 102701

DESCRIPTION

Access flooring is an integrated system of load-bearing panels and supports. This assembly creates a "raised flooring" system with removable panels that allows access to the area below. This flooring system is used primarily in computer rooms because it provides easy access to cables and venting systems under the flooring for temperature maintenance. 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/COMPONENT

Access Flooring (CSI 10270)

Strinaerless Systems:

Stringerless understructures consist of pedestals without stringers. The lateral stability of the pedestals are at the panel level. The pedestal support assembly is at the pedestal base and is adhered to the subfloor. The panels are supported through their connections at the pedestal head, except at perimeters or where extra support is required. Pedestals are typically located so that each pedestal head supports four panels at each corner. Stringerless systems provide maximum access to the underfloor cavity. Of the two options described below, the first provides quickest access because no tools other than a panel lifter are required to remove panels.

- Gravity-Held Panels: Gravity-held panels are secured in place by nesting on an interlocking connection formed in both the panel and the pedestal head. Gravity-held panels are specified with either factory-applied floor covering or are bare for field-applied carpet tiles. Stringerless understructures are less stable laterally than those with stringers, and are consequently limited to lower finished floor heights and are less capable of withstanding lateral forces from earthquakes and other sources.
- Bolted-Down Panels: Bolted-down panels are directly connected to pedestal heads by fasteners located in panel cores. Bolting panels to pedestals improves the entire system's lateral stability and resistance to rocking and overturning. The latter effect can result where partitions are fastened to panels and are subject to unbalanced loads that are not resisted by ceiling connections or other means.

Stringer Systems (CSI 10270)

Stringer systems are offered with either bolted or snap-on (non-bolted) stringers. With either system, the purpose of the stringers is to provide additional lateral support, particularly where panels are frequently removed or where finished floor heights or earthquake loads exceed those which can be accommodated by stringerless systems. Where stringers include a gasket and support panel edges, they can contribute to the support of dynamic loads transmitted through panels.

Bolted Strinaer Systems:

Bolted stringer systems consist of main stringers, usually 2 to 3 modules long, and cross stringers, one module long, that are bolted to pedestals. These stringers may or may not support panel edges, depending on which products are deemed acceptable. For installations requiring both a bolted grid and frequent stringer removal, it may be more convenient to specify a system with all stringers only one module long.

0.11.06 ACCESS FLOORS (CSI 10270)

ASSOCIATED ASSEMBLY/COMPONENTS

Stringer Systems (CSI 10270) (Continued)

Snap-On Stringer Systems:

Snap-on stringer systems consist of stringers, each one module in length, and are located under the edge of each panel that interlock with pedestal heads without the use of threaded fasteners. This makes the removal of grid members more convenient because no tools are needed. Again, the panel edges may or may not be supported on grid members because manufacturers vary in how their stringers relate to panels.

Pedestals are formed on the screw jack principle, which offers ease of vertical adjustment. Changes in height are accommodated by a threaded rod or tube telescoping into a hollow tube to which is attached an elevating nut and positive locking device for maintaining position. Head types vary in design according to panel type, method of panel attachment (gravity-held or bolted), and type of stringer, if any, to be supported. Regardless of panel and understructure system selected, it is considered good practice to adhere pedestal bases to the subfloor in a manner that will resist the horizontal forces specified.

Floor Finish **Coverings** (All **Systems)** (CSI 09000)

Floor coverings are available in a wide range of materials and applications. Some carpet tiles are applied to access floors. If carpet tile is used, consideration should be given to specifying a glued down installation due to removal frequency over the life of the floor.

In critical, computer-intensive environments, it is necessary to have anti-static floor finishes. For standard computer areas, 1 to 2 kiloVolt is an acceptable range. In supercritical environments that are extremely static sensitive, such as plants assembling electronic components from chips, floor covering alone cannot provide sufficient static protection and must be augmented by other means such as conductive shoes and furniture. With the increased use of access flooring for offices and for entire floors, other types of floor coverings are used by those panels designed to support heavy static and rolling loads. Possible floor coverings include marble tile, thicker panels of cut stone, and ceramic tile.

CHARACTERISTICS OF ACCESS FLOOR PANELS

Characteristics and other considerations associated with the various types of floor panels included in the text are discussed below.

Steel-Covered Wood Core Panels:

- Sound Damping Qualities: Wood core absorbs machine noise and traffic sound. Hollow construction can resonate under foot traffic and produce drumming sounds. Carpeting can compensate for this to a limited degree.
- Structural Performance: Generally capable of supporting concentrated loads in the medium range (1,000 to 1,200 lbf) and medium to light rolling loads (500 to 600 Ibf). Wide choice of panel construction with capabilities to withstand concentrated loads ranging from 600 to 1,500 Ibf, but limited in capability to withstand rolling loads (600 lbf).
- Applications: For general office areas and computer rooms subject to static and dynamic loads within the selected panel's structural capabilities.
- Understructure Types Available: Stringerless, stringerless with bolted panels, snap-on stringers, and bolted stringers.

0.11.06 ACCESS FLOORS (CSI 10270)

ASSOCIATED ASSEMBLY/COMPONENTS

CHARACTERISTICS OF ACCESS FLOOR PANELS (Continued)

Cementitious-Filled Formed Steel Panels:

- Sound Damping Characteristics: Traffic noise deadened by cementitious material that increases mass and fills the panel cavity giving the panel a solid feeling underfoot.
- Fire Performance Characteristics: Noncombustible.
- Thermal Insulating Qualities: Fair, due to variations in fill thickness caused by pockets formed into bottom pan.
- Structural Performance: Widest choice of panel constructions with capabilities to withstand concentrated loads ranging from 600 to 2,000 Ibf and highest rolling loads (from 500 up to 2,000 lbf).
- Applications: General offices, computer rooms, clean rooms, and light manufacturing subject to heavy-duty static and dynamic loads within the selected panel's structural capabilities. One manufacturer, Floating Floors, Inc., questioned the suitability of this type of panel construction in computer rooms where the underfloor cavity is used for air distribution and in clean rooms because of potential dusting problems.

Die-Cast Aluminum Panels:

- Sound Damping Characteristics: Depends on interfit between panels and pedestal to reduce sound from traffic induced vibrations.
- Fire Performance Characteristics: Noncombustible, flame spread and smoke developed rating of 0 per ASTM E84.
- Thermal Insulating Qualities: Poor, aluminum conducts heat readily.
- Structural Performance: Capable of withstanding a concentrated load of 1,000 Ibf and a rolling load of 850 Ibf.
- Understructure Types Available: Stringerless; snap-on or bolted stringer available from several manufacturers. Horizontal braces are available for stringerless understructures.
- Applications: Computer rooms, clean rooms, control rooms, laboratories, and similar critical environments requiring a nonferrous floor panel that will not disrupt magnetic fields.

Liahtweiaht-Concrete-Filled Steel Pan Panels:

- Sound Damping Characteristics: Concrete fill helps absorb traffic sounds and contributes to a solid feeling underfoot.
- Fire Performance Characteristics: Noncombustible, flame spread ratings of less than 25 per ASTM E 84.
- Thermal Insulating Qualities: Fair, better than cementitious-filled steel panels; due to consistent fill thickness throughout.
- Structural Performance: Capable of withstanding medium to light concentrated loads, depending on product selected, and light rolling loads.
- Understructure Types Available: Stringerless, stringerless with bolted down panels, snap-on stringers, and bolted stringers.
- Applications: For general offices with medium to light static and dynamic loads within the selected panel's structural capabilities.

0.11.06 ACCESS FLOORS (CSI 10270)

ASSOCIATED ASSEMBLY/STANDARD COMPONENTS

CHARACTERISTICS OF ACCESS FLOOR PANELS (Continued)

Reinforced Linhtweiaht Concrete Panels:

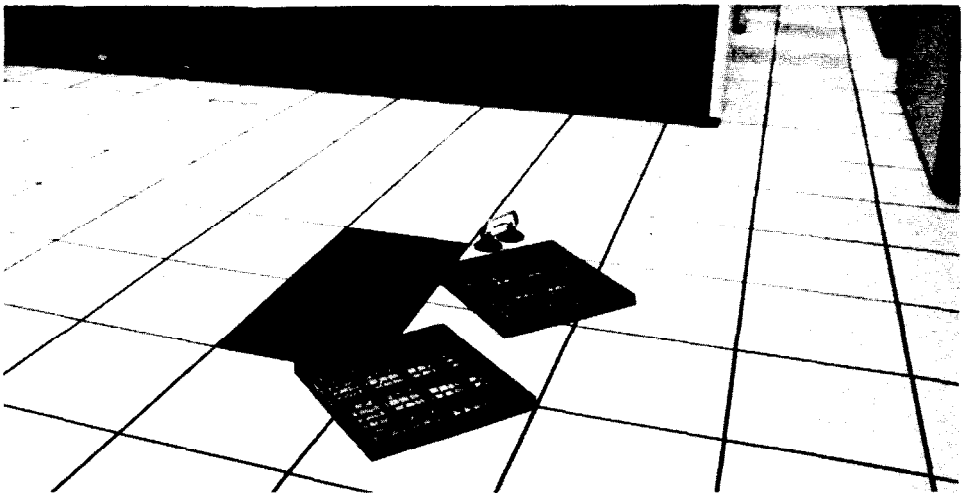
- Sound Damping Characteristics: All concrete construction absorbs traffic sounds and contributes to a solid feeling underfoot.
- Fire Performance Characteristics: Noncombustible.
- Thermal Insulating Qualities: Good, better than cementitious-filled steel panels, not as good as wood core panels.
- Structural Performance: Capable of withstanding light to medium (750 to 1,000 lbf) concentrated and dynamic loads, depending on product selected.
- Understructure Types Available: Innocrete's "S-Floor" system is a stringerless system with bolted panels.
- Applications: For general offices with medium to light static and dynamic loads within the selected panel's structural capabilities.

Fiber-Reinforced Calcium Sulfate Panels:

- Sound Damping Characteristics: High density of material absorbs traffic sounds and contributes to a solid feeling underfoot.
- Fire Performance: Noncombustible.
- Structural Performance: Capable of withstanding low (600 lbf) concentrated and dynamic loads; improved to medium (1,000 lbf) with addition of steel plate laminated to bottom of panel.
- Understructure Types Available: Stringerless, snap-on stringers, and bolted stringer support systems.
- Applications: Panels without bottom steel plates are advertised as suitable for general offices and computer rooms, and with bottom plates for computer rooms and manufacturing plants.

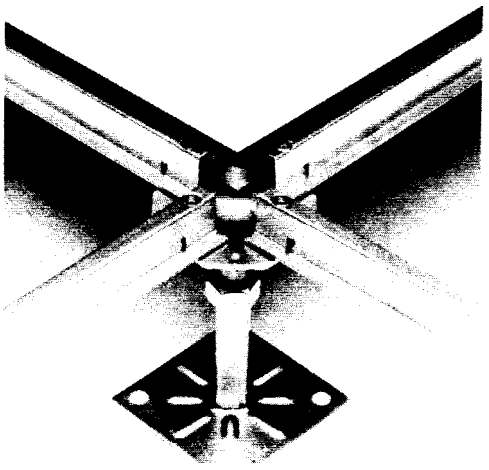
OTHER RELATED COMPONENTS

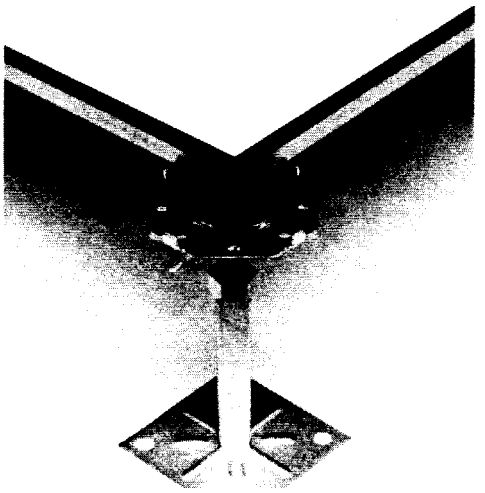
Refer to Superstructure and Interior Finishes and Construction, Volumes 3 and 6, for additional deficiencies that may impact this system.

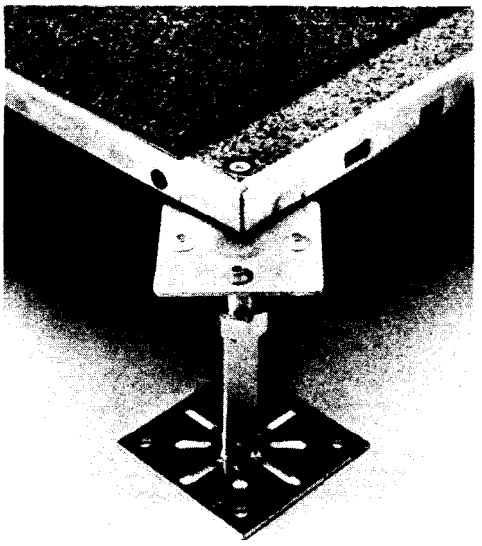


SOURCE: TATE ACCESS FLOORS

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL ACCESS FLOORS		
ACCESS FLOORS (CSI 10270)	Revision No.	Issue Date 5/93	Drawing No. A1106-1







SOURCE: CTEC ACCESS FLOORING SYSTEMS

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	SUPPORT SYSTEMS FOR ACCESS FLOORS		
ACCESS FLOORS (CSI 10270)	Revision No.	Issue Date 5/93	Drawing No. A1106-2

DEFICIENCY FACTORS
0.11.06 ACCESS FLOORS **(CSI** 102701

PROBABLE FAILURE POINTS

- Amount and type of pedestrian traffic excessive of design tolerance.
- Crumbling flooring caused by vehicular traffic (eg., carts, wheel chairs).
- Exposure to stains and cigarette burns capable of staining, softening, or otherwise damaging flooring.
- Impact damage caused by unsuitable exposure conditions and/or location, abuse by shoes, furniture, etc.
- Exposure to in-surface damage such as cuts, tears, punctures, permanent surface indentations, and gouges.
- Seams improperly installed causing premature wear.
- Door or deteriorated substrate leading to lifting, mastic flow at seams, uneven wear.

SYSTEM ASSEMBLY/DEFICIENCIES

Abrasion:	Contact with moving parts.
Staining:	Discoloration in the flooring caused by foreign material.
Tearing:	Objects passing across the surface of the flooring.
Heat Aging:	Direct sunlight affects the surface by ultra-violet rays.
Loose Seams:	Pedestrian/vehicular traffic (eg., carts, wheel chairs).
Black Marks:	Exposure to environmental abuse by shoes, furniture, etc.
impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Improper Bonding:	Lack of adhesion causing flooring to come apart at the seams.
Missing Flooring/Section:	Excessive wear, poor installation practices.

DEFICIENCY FACTORS
0.11.06 ACCESS FLOORS (CSI 10270)

END OF SUBSECTION

0.11.07 INTEGRATED CEILINGS (CSI 09500)

DESCRIPTION

In contemporary commercial construction, the suspended ceiling is almost always employed to allow easy access to mechanical equipment. A more recent development has led to integrated ceilings that include lights and acoustical treatment while providing built-in venting used by mechanical systems. Luminous skylights, elegant reflective surfaces, fabric-covered ceilings, open plenum treatments, space frames, and linear metal can enhance the ceiling structure greatly. 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/COMPONENTS

Integrated Ceilings **(CSI 09500)**

Integrated ceilings consist of lighting fixtures, air handling components, acoustical blankets, beam splices, and/or recessed or flush filler strips that are integrated into the ceiling to bring them into accord with each other. An integrated ceiling is supported by pencil or threaded rods, which are in turn suspended from both main and interlocking beams; metal framing also supports light diffusers, Steel integrated ceilings offer greater strength, whereas aluminum ceiling components are suitable for high moisture areas.

Integrated ceilings can be set in a support grid of metal framing that is supported by pencil or threaded rods suspended from the structure above. Integrated ceilings are perforated or nonperforated in various ways to absorb sound, or a sound baffle can be used. It is important to remember that the ceilings absorb sound, but they do not prevent sound transmission to any appreciable extent.

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

Integrated ceilings serve many purposes in today's construction. In addition to acoustical control, many elements must be coordinated in their selection and detailing. These include determining required clearances for recessed lights, verifying clearances for duct work, locating sprinklers, fire alarm speakers, smoke detectors, drapery pockets, and other recessed fixtures. Specially designed vents are often used with integrated ceiling systems.

Integrated 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 in themselves cannot be rated. Rated ceiling systems consist of rated material and rated grid systems, that include hold-down clips to keep the ceiling in place and expansion slots to allow the grid to expand if subjected to heat.

Finishes:

Manufacturer finishes generally consist of baked enamel. Some integrated ceilings consist of mirrors, bright and brushed stainless steel finishes, or custom paints.

OTHER RELATED COMPONENTS

Refer to Interior Finishes and Construction, Volume 6, for additional deficiencies that may impact this system.

0.11.07 INTEGRATED CEILINGS (CSI 09500)

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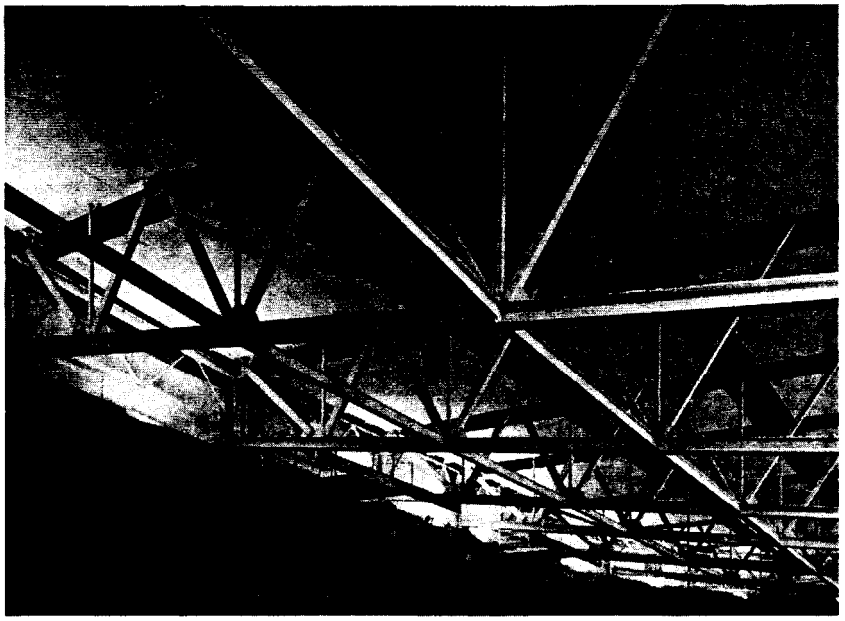

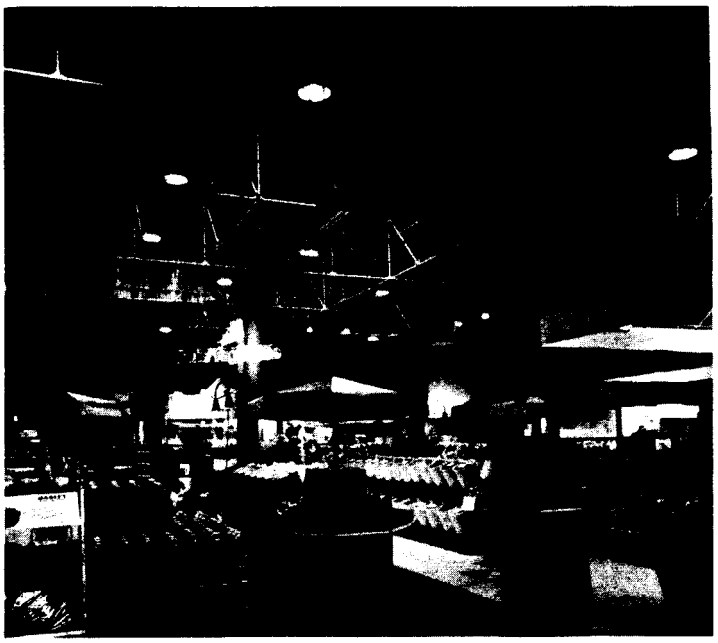

SOURCE: USG INTERIORS, INC., INTEGRATED CEILINGS AND CEILING SYSTEMS CATALOG

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL INTEGRATED CEILINGS		
INTEGRATED CEILING (CSI 13025)	Revision No.	Issue Date 5/93	Drawing No. A1107-1

DEFICIENCY FACTORS
0.11.07 INTEGRATED CEILINGS (CSI 09500)

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.
- Missing tile.
- Loose and/or broken support/suspension system caused by improper installation.
- Water damage caused by leaking subsystem, condensation from plumbing pipes.
- Termite and boring insect damage to 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.
- Metal corrosion caused electro-chemical process that occurs in the presence of air and moisture.

SYSTEM ASSEMBLY/DEFICIENCIES

Water Damage:	Roof leakage, sprinkler system malfunction.
Holes/Punctured/Cracked:	Impact damage.
Missing Ceiling Support:	Poor construction installation.
Deteriorated Support:	Water damage.
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.
Corrosion:	Resulting from a chemical or electro-chemical reaction that converts the metal into an oxide, carbonate, and/or sulfide.
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/Tiles:	Corrosion of supporting accessories, improper installation.

DEFICIENCY FACTORS
0.11.07 INTEGRATED CEILINGS (CSI 09500)

END OF SUBSECTION

0.11.08 MEZZANINE STRUCTURES (CSI 13125)

DESCRIPTION

Mezzanines are used for many purposes and are available in many forms depending on the intended use. Free-standing mezzanines are available in two formats: modular and custom. Modular mezzanines are usually standardized pre-fabricated modules of various sizes that can be assembled into many configurations by using different module combinations. Modular formats are often used when there are no unusual loading or configuration requirements. Custom mezzanines are designed to the user's specifications for load and configuration. 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/COMPONENTS

Mezzanine Structures (CSI 13125)

Deck Surfaces:

Deck surfaces can be of many types, ranging from plywood to specialized overlays. Decking is a very important part of any mezzanine and should be selected carefully considering strength required and intended use.

Solid Flooring:

Solid flooring can be supplied in a variety of materials such as plywood, wood planking, steel floor planks, wood/metal composites, light-weight concrete, and metal planking. Sliding storage considerations as well as security, lighting, heating, ventilating, air conditioning, sound control, or other concerns above or below the mezzanine may suggest the selection of a solid deck surface. The walking and kneeling comfort of personnel is generally enhanced on a solid deck. Some of the solid floor types may not be recommended when heavy wheeled traffic is expected. The following deck type descriptions will provide information related to specific uses that may influence your selection.

Plywood Flooring (CSI 06100)

Plywood may be applied directly to the joist flashing members of the mezzanine provided the proper grade and thickness is selected. This type floor will require closely spaced joist framing. Consideration should also be given to protection from abrasive or wheeled loads to guard against rolling shear and damage to the plywood.

Wood plank Flooring (CSI 06100)

In this system the planking provides a working and wearing surface and allows for somewhat greater spans than in the directly applied plywood type flooring. The planks are applied directly to the joist framing members of the mezzanine. This type flooring usually works well with heavy, concentrated, or wheeled loads.

Wood/Metal Composite Floors (CSI 05300 & 06100)

Composite flooring systems are built-up using a subdeck underlayment of corrugated metal deck with the top deck working surface created from a variety of materials such as plywood or metal plate. The metal deck can provide structural strength to allow economical joist spacing and a good contact area for support of the top deck working surface.

The subdeck underlayment is available in a range of metal thicknesses and profiles for different loading and framing conditions. This product is visible from the underside of the mezzanine as a corrugated surface and can offer excellent light reflectivity depending on color selected.

0.11.08 MEZZANINE STRUCTURES (CSI 13125)

ASSOCIATED ASSEMBLY/COMPONENTS (Continued)

Plywood Over Corruaated Metal Deck:

This flooring is solid, sturdy, and may be suitable for many applications. Plywood of all grades and thicknesses is available and can include various specially laminated surfaces of metals, synthetics, or abrasives.

Reference should be made to the selection factors previously discussed to determine the appropriate plywood thickness and grade to be used as a working surface over the steel deck. When heavy rolling loads, such as pallet jacks, are part of the design considerations, a protective layer such as sheet metal or a laminated plastic surface should be placed over the plywood to guard against rolling shear and damage to the plywood.

Steel Floor Plate on Corrugated Metal Deck:

This traditional system provides a heavy duty floor. It is appropriate for pallet jack operations and other applications that require abrasion and/or skid resistance. These steel plate products are commonly referred to as diamond plate, checkered plate, and flat plate.

Poured Concrete on Corruaated Metal Deck:

Permanent (non-demountable) mezzanine structures can utilize poured concrete floors that meet durability and heavy traffic needs. The mezzanine support structure should be designed to support the wet concrete load or temporary shoring should be used until the concrete cures. Perimeter forming is also required.

Solid **Metal** Plank Flooring (CSI 05300)

These narrow (6 to 12 inches wide) formed metal sections provide an integrated surface. They are relatively lightweight for ease in installation and are available in longer lengths than most deck materials. Point or impact loading should be considered when selecting this deck type.

OPEN-TYPE DECK OPTIONS

Open-type decking can be used where light, sound, air, or sprinkler water passage is required. This need has traditionally been filled by various types of grating. In general, open rung or ventilated products may be less accommodating to wheeled traffic than solid floor types.

Formed Metal Plank **Grating** (CSI 05530)

This system has characteristics similar to solid metal planking, except that the top surface is open in either a steel rung or reticulated hole pattern. Either opening type can be manufactured with a smooth or highly slip-resistant surface.

Steel Bar **Grating** (CSI **05530)**

This is an open rectangular steel bar grid system available in large panels. The grid dimensions and bar sizes may be varied to satisfy a wide range of use, space, and loading conditions. Bar grating can offer good resistance to wear, and provides approximately 80 percent open area for heat, light, and air transfer. It can be supplied in a painted or galvanized finish.

ACCESSORIES

Stairways (CSI 05000)

Stairways are available in a variety of styles to suit any access or code requirement. Codes will dictate type, quantity, and locations of points of egress. The quantity and location of stairways may greatly affect the use of the areas on and under the mezzanine. Typical styles and features follow:

0.11.08 MEZZANINE STRUCTURES (CSI 13125)

ASSOCIATED ASSEMBLY/COMPONENTS

ACCESSORIES

Stairways (CSI 05000) **(Continued)**

- Open-Type: Bar grating or perforated plank type grating treads with open risers.
- Closed-Type: Solid tread of flat or diamond plate steel with open or closed risers.
- Internal: Located within the confines of the mezzanine framework.
- External: Located outside of the mezzanine framework.
- Spiral: Usually used when there are space restrictions or as a secondary means of egress. They may not be practical for material transport and have severe usage limitations.
- Other/Ladders: Fixed ladders and steep ascent stairways for secondary egress include vertical ladders, ships type ladders, and alternating tread stairways.
- Runout: Stairway runout, the horizontal distance the stair will consume, is relative to the rise and tread dimensions. The riser and tread dimensions are usually controlled by the applicable building code.
- Landings: Landings are usually used at intermediate stairway levels (as may be required by codes), and at the top of an external stair when the stairway is parallel to the mezzanine, or as an entry platform to a doorway.

Guards (CSI **05520)**

- Guardrails: Guardrails are subject to and must meet applicable codes. All open sides and openings within a mezzanine should be provided with proper code-approved protection. Guardrails are normally used for this purpose.
- Netting & Fencing: When designed to meet the requirements of applicable codes, netting and fencing can provide the same function as guardrails. Netting and fencing can also be used to create security and safety barriers.
- Kickplates: All open sides of a mezzanine should be provided with a properly designed kickplate at the base of the railing to minimize the chance of material and debris falling from overhead.
- Gates: Swing, sliding or rolling, lift-out, chain, safety, or other gate types can facilitate material movement to and from the mezzanine.

OTHER RELATED COMPONENTS

Refer to Superstructure and Interior Finishes and Construction, Volumes 3 and 6, for additional deficiencies that may impact this system.

0.11.08 MEZZANINE STRUCTURES (CSI 13125)

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SOURCE: WILDECK MEZZANINES, INC., 1989 SWEET'S CATALOG

SYSTEM ASSEMBLY DETAILS-SPECIALTY SYSTEMS	TYPICAL MEZZANINE STRUCTURES		
MEZZANINE STRUCTURES (CSI 13145)	Revision No.	Issue Date 5/93	Drawing No. A1108-1

DEFICIENCY FACTORS
0.11.08 MEZZANINE STRUCTURES (CSI 13125)

PROBABLE FAILURE POINTS

- Metal corrosion is an electrochemical process that occurs in the presence of air and moisture.
- 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 or improper tightness.
- Cracking caused by stress, settlement/movement, poor materials, or improper construction.
- Impact damage caused by object striking or impacting the surface.

SYSTEM ASSEMBLIES/DEFICIENCIES

Abrasion:	Contact with moving parts across the surface.
Burned or Charred Surface:	Damage from fire or excessive heat on surface.
Corrosion:	Resulting from a chemical or electro-chemical reaction which converts the metal into an oxide, carbonate, and/or sulfides.
Cracking:	Cracking, usually structural in nature, which results in tearing, ripping, or shearing. Cracks can be random, horizontal, vertical, or diagonal.
Dry Rot/Decay:	Breakdown of structural integrity from mold/mildew or dry rot.
Impact Damage:	Depressions, dents, or buckled surface from objects striking or impacting the surface.
Insufficient Anchors/Connections:	Broken, damaged, loose, corroded, or missing anchorage or fasteners caused by vibration, excessive deflection, or improper tightness.
Loose Connections:	Impact, vibration, tightness.
Loss of Protective Coating/Paint:	Chalking, peeling, chipping, blistering, or deterioration.
Missing Sections:	Rotting, missing, corroded, deteriorated sections or supports.
Surface Deterioration:	Crazing or small surface cracks or surface corrosion and breakdown due to chemicals, pressure, or other actions.
Staining:	Surface discoloration from a foreign substance or material.
Splitting:	Splitting or tearing of surface.

DEFICIENCY FACTORS
0.11.08 MEZZANINE STRUCTURES (CSI 13125)

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 specialty systems inspection. Sheets have been developed for each major type and associated assembly/components as follows:

TABLE ONE

Assembly/Component	Control Number
CANOPIES	GSS 0.11 .01
LOADING DOCK SYSTEMS	GSS 0.11.02
TANKS..	GSS 0.11.03
DOMES (BULK STORAGE, METAL FRAMING).	GSS 0.11.04
LOUVERS & VENTS..	GSS 0.11.05
ACCESS FLOORS	GSS 0.11.06
INTEGRATED CEILINGS..	GSS 0.11.07
MEZZANINE STRUCTURE	GSS 0.11.08

INSPECTION METHODS - STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: CANOPIES
CONTROL NUMBER: GSS 0.11 .01

APPLICATION

This guide applies to all Canopies.

SPECIAL INSTRUCTIONS

1. Review manufacturer's or installer's instructions.
2. Schedule this work during dry conditions.
3. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
4. Use extreme care when working in high places.
5. Follow established safety procedures and policies.
6. Review historical documentation to identify prior problem areas.

CONCURRENT ACTIONS

1. Inspect all flashing.
2. Inspect parapets, if applicable. (See GSS 0.0507)
3. Inspect downspouts, gutters, and/or roof drains. (See GSS 0.0509)
4. Inspect all roof penetrations. (See GSS 0.0508)
5. Inspect skylights as applicable. (See GSS 0.05.10)

INSPECTION ACTIONS

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

1. Check general appearance for leaves or any debris that may have accumulated.
2. Check for overall water tightness including presence, location, and duration of, any water leaks. Verify any historical information for leaks during long-continued rain, leaks occurring every rain, etc.
3. Check for locations or presence of dampness and stains; note locations, type, and cause.
4. Check all seams and flashing for wind damage, damaged or missing fasteners, or other deterioration.
5. Check all roof penetrations for loose anchorage, cracks, and holes, etc.
6. Check for damage to structure caused by impact, weather, or vandalism.
7. Check for sagging, split, or torn fabric.
8. Check for missing or broken components.
9. Check for corrosion, pitting, scaling, or finish loss.
10. Check for movement or settlement.
11. Check wood, if applicable, for insect damage, rot, softness, or splitting.
12. Check for cracked or corroded welds.
13. Check painted surfaces for peeling, cracking, or chalking.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. Ladder

INSPECTION METHODS - STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: LOADING DOCK SYSTEMS
CONTROL NUMBER: GSS 0.11.02

APPLICATION

This guide applies to all Loading Dock Systems.

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. Consult a licensed structural engineer for significant deficiencies.
4. Refer to glossary and references as needed.

CONCURRENT ACTIONS

Inspect foundations and footings, substructure, and exterior closure for any other signs of damage or deterioration that may be related to Loading Dock System deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Loading Dock Systems includes visual survey, examination of building records, and analysis. Points include:

1. Check for corrosion of metal components.
2. Check concrete for cracking, scaling, spalling, or deterioration.
3. Check wooden members, if applicable, for insect damage, rot, softness, splitting, or bulging.
4. Check for damage caused by vehicular impact, weather, or vandalism.
5. Check for missing or broken components.
6. Check for signs of settlement or movement.
7. Check for cracked or corroded welds.
8. Check for loose, damaged, or missing fasteners.
9. Observe lifts and levelers with the passage of loads for excessive deflection or unusual noises.
10. Check painted surfaces for peeling, chipping, or cracking.
11. Check for damaged, missing, or non-functional lighting fixtures.
12. Check electrical connections for tightness.
13. Check for hydraulic fluid leaks, if applicable.
14. Check deck drains for debris buildup.
15. Check all previous repairs and patches for cracking or deterioration.
16. Check all joints for deterioration or cracking.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS ▪ STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: TANKS
CONTROL NUMBER: GSS 0.11.03

Please refer to the following table for specific guide sheets referencing tank information in various related subsections:

VOLUME	GUIDE SHEET TITLE	GUIDE SHEET
0.08 Mechanical	Compressed Gas Storage Tanks	GSS 0.08.01.03
0.08 Mechanical	Storage Tanks	GSS 0.08.01 .12
0.08 Mechanical	Tanks & Sumps	GSS 0.08.01 .13
0.08 Mechanical	Condensate Return Tanks	GSS 0.08.03.04

INSPECTION METHODS - STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: DOMES (BULK STORAGE, METAL FRAMING)
CONTROL NUMBER: GSS 0.11.04

APPLICATION

This guide applies to all Domes (Bulk Storage, Metal Framing).

SPECIAL INSTRUCTIONS

1. Review manufacturers or installer's instructions.
2. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
3. Use extreme care when working in high places.
4. Follow established safety procedures and policies.

CONCURRENT ACTIONS

1. Inspect downspouts, gutters, and/or roof drains. (See GSS 0.05.09)
2. Inspect all roof penetrations.
3. Inspect skylights as applicable. (See GSS 0.0510)

INSPECTION ACTIONS

Condition Assessment Survey of Dome Systems includes visual survey, examination of building records, and analysis. Points include:

1. Check general appearance and condition of sealants for cracking, deformation or deterioration.
2. Check for overall water tightness including presence, location, and duration of any water leaks. Verify any historical information for leaks during long-continued rain, leaks occurring every rain, etc.
3. Check for locations or presence of dampness and/or stains. Note locations and determine type of stain and cause.
4. Check general appearance and condition of metal frames for indications of excessive corrosion, pitting, scaling, checking, warping, and finish loss.
5. Check for loose, damaged, or missing fasteners.
6. Check for damage caused by impact, weather, or vandalism.
7. Check for cracked or corroded welds.
8. Check painted surfaces for cracking, chipping, blistering, chalking, peeling.

TOOLS & MATERIALS

1. Standard Tools - Basic
2. Ladder, if required

INSPECTION METHODS - STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: LOUVERS & VENTS
CONTROL NUMBER: GSS 0.11.05

APPLICATION

This guide applies to all Louvers and Vents.

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. Review historical documentation prior to inspection.
4. Refer to glossary and references as needed.

CONCURRENT ACTIONS

1. Inspect foundations and footings, substructure, exterior closure, and roofing for any other signs of damage or deterioration that may be related to louver and vent deficiencies.
2. Preventive maintenance tasks.

INSPECTION ACTIONS

Condition Assessment Survey of Louvers and Vents includes visual survey, examination of building records, and analysis. Points include:

1. Check for cracking or corrosion of metal parts.
2. Check for sagging, split, or torn fabric.
3. Check for missing or broken components.
4. Check for damage caused by impact, weather, or vandalism.
5. Check for loose or missing fasteners.
6. Check painted surfaces for chipping, cracking, or peeling.
7. Check for water tightness or extent of leaks.
8. Check for buildup of debris causing blockage of air flow.
9. Check wood members, if applicable, for insect damage, rotting, splitting, softness, or bulging.
10. Check for proper lubrication and free movement of vanes, if applicable.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS ▪ STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: ACCESS FLOORS
CONTROL NUMBER: GSS 0.11.06

APPLICATION

This guide applies to all Access Floor 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 access floor systems deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Access Floor Systems includes 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 of 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 conditions of any possible cracking or deterioration.
6. Check for any plant or microorganism growth such as moss, bacteria, molds, or fungi.
7. Check for any insect damage; i.e., termites or carpenter ants.
8. Check for sagging, loose spots, or pull aways.
9. Check for edge curling, tears, uneven appearance, and water spotting.
10. Check for unevenness at joints, warped or buckled floors, and squeaks.
11. Check carpet for worn spots, holes, tears, frayed edges, rough, and/or damaged seams.
12. Check condition of anchorage to verify that anchorage is intact, in place, and properly tightened.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS - STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: INTEGRATED CEILINGS
CONTROL NUMBER: GSS 0.11.07

APPLICATION

This guide applies to all Integrated Ceilings.

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 Integrated Ceilings includes visual survey, examination of building records, and analysis. Points include:

1. Check for corrosion of metal framework and accessories.
2. Check for water or moisture damage.
3. Check for unevenness, especially at joints and around fixtures.
4. Check condition of anchorage to verify that anchorage is intact, in place, and properly tightened.
5. Check for any microorganism growth such as moss, bacteria, molds, or fungi.
6. Check for signs of movement or settlement.
7. Check for missing, loose, or broken components.
8. Check for impact damage; i.e., holes, dents, scratches.
9. Check wood, if applicable, for insect damage, rot, softness, or splitting.
10. Check for signs of stress or improper alignment.
11. Check for any structural defect that may cause movement of existing slab, which can cause various ceiling defects.
12. Check painted surfaces for peeling, chalking, chipping, blistering, or deterioration.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS . STANDARD

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INSPECTION METHODS - STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: MEZZANINE STRUCTURES
CONTROL NUMBER: GSS 0.11.08

APPLICATION

This guide applies to all Mezzanine Structures.

SPECIAL INSTRUCTIONS

1. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
2. Review as-builts and other historical documentation prior to initiating the inspection.
3. Observe established safety procedures during the inspection.

CONCURRENT ACTIONS

1. Inspect floors. (GSS 0.03.03)
2. Inspect substructure and superstructure for any signs of damage or deterioration that may be related to mezzanine deficiencies.

INSPECTION ACTIONS

Condition Assessment Survey of Mezzanine Structures includes visual survey, examination of building records, and analysis. Points include:

1. Check condition of anchorage to verify that it is in place and properly tightened.
2. Check for corrosion of metal components.
3. Check for cracked and corroded welds.
4. Check for signs of settlement or movement.
5. Check for damage caused by impact or vandalism.
6. Check wooden member, if applicable, for insect damage, rot, softness, or splitting.
7. Check concrete, if applicable, for scaling, spalling, cracking, or deterioration.
8. Check for loose damaged or missing fasteners.
9. Check grating for broken welds and alignment.
10. Check painted surfaces for peeling, cracking, or excessive chalking.
11. Check fabric or netting, if applicable, for sagging, splitting, or tears.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS - STANDARD

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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 Specialty System 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
CANOPIES	GSNS 0.11 .01
LOADING DOCK SYSTEMS..	GSNS 0.11.02
TANKS	GSNS 0.11.03
DOMES (BULK STORAGE, METAL FRAMING).	GSNS 0.11.04
LOUVERS &VENTS	GSNS 0.11.05
ACCESS FLOORS	GSNS 0.11.06
INTEGRATED CEILINGS	GSNS 0.11.07
MEZZANINE STRUCTURES	GSNS 0.11.08

INSPECTION METHODS - NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: CANOPIES
CONTROL NUMBER: GSNS 0.11 .01

APPLICATION

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

SPECIAL INSTRUCTIONS

1. Review manufacturer's or installers instructions.
2. Schedule this inspection during dry conditions.
3. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
4. Use extreme care when working in high places.
5. Follow established safety procedures and policies.
6. Review any warranties for special requirements.
7. Refer to references and glossaries as needed.
8. Review historical documentation to identify prior problem areas.

CONCURRENT ACTIONS

1. Inspect parapets.
2. Inspect downspouts, gutters, and/or roof drains as part of overall problems that could enhance the deficiencies of the canopies systems.
3. Inspect all penetrations.
4. Inspect all service walkways, if applicable.
5. Inspect underside of structure for dampness, stains, rust or any other signs of damage or deterioration.
6. Complete inspection requirements listed in GSS 0.11 .01.

INSPECTION ACTIONS

Based on results of GSS 0.11 .01 and/or as directed, proceed to non-standard inspections. Points include:

1. Welded joints of metal canopy systems can be x-rayed or ultrasonic tested to determine degree of deterioration and material thickness.
2. Perform a Pick test to determine degree of deterioration, decay, or rot for wooden members.
3. Magnetic particle testing can be employed to test for surface flaws in material.
4. Perform an environmental data analysis to determine the effects of external conditions on the roof materials. This should include analysis of any corrosion to determine cause and type.

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: LOADING DOCK SYSTEMS
CONTROL NUMBER: GSNS 0.11.02

APPLICATION

This guide applies to all non-standard inspection procedures for Loading Dock Systems.

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.
4. It is recommended that such non-standard inspection be performed under the supervision of a licensed structural engineer - based on his/her review of standard inspection results, the following tests and analysis may be recommended (can include all or some of the tests listed below).

CONCURRENT ACTIONS

1. Inspect foundations and footings, substructure, and exterior closure for any other signs of damage or deterioration that may be related to Loading Dock Systems deficiencies.
2. Complete inspection requirements listed in GSS 0.11.02.

INSPECTION ACTIONS

Based on results of GSS 0.11.02 and/or as directed proceed to non-standard inspections. Points include:

1. Perform an environmental data analysis to determine the effects of external conditions.
2. Perform surface hardness testing or maturity concept analysis to determine material condition and locate possible defects or deficiencies within the material.
3. 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.
4. Perform infrared or nuclear analysis testing to determine if water or moisture is present, indicating general location of cracks or breaks.
5. Perform ultrasonic pulse velocity test to locate defects within the material to determine degree of deterioration and material thickness.
6. Perform magnetic test to determine material thickness and reinforcement location.
7. Perform electrical resistivity test to determine moisture content, material thickness, and degree of corrosion or deterioration.
8. Perform radiography (X-Ray) testing to detect cracking, internal defects and deficiencies.
9. Perform microwave absorption scanning to determine moisture content and material defects. This is a relatively new method and is still under development.
10. Perform acoustic emission test to determine stress points and material deformations. This is a difficult test requiring dynamic loading conditions.
11. Perform full load test of hydraulic lifts to pinpoint leak source and verify lift capacity.

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: TANKS
CONTROL NUMBER: GSNS 0.11.03

Please refer to the following table for specific guide sheets referencing tank information in various related subsections:

VOLUME	GUIDE SHEET TITLE	GUIDE SHEET
0.08 Mechanical	Compressed Gas Storage Tanks	GSNS 0.08.01.03
0.08 Mechanical	Storage Tanks	GSNS 0.08.01.12
0.08 Mechanical	Tanks & Sumps	GSNS 0.08.01 .13
0.08 Mechanical	Condensate Return Tanks	GSNS 0.08.03.04

INSPECTION METHODS . NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: DOMES (BULK STORAGE, METAL FRAMING)
CONTROL NUMBER: GSNS 0.11.04

APPLICATION

This guide applies to all non-standard inspection procedures for Domes (Bulk Storage, Metal Framing).

SPECIAL INSTRUCTIONS

1. Review manufacturer's or installer's instructions.
2. Schedule this inspection prior to heating and cooling seasons during dry conditions.
3. This is a general inspection, and deficiencies should be handled on a service call or repair basis.
4. Use extreme care when working in high places.
5. Follow established safety procedures and policies.
6. Review any roofing warranties for special requirements.
7. Refer to references and glossaries as needed.

CONCURRENT ACTIONS

1. Inspect downspouts, gutters, and/or roof drains.
2. Inspect all service walkways, if applicable.
3. Inspect underside for dampness, stains, rust, or any other signs of damage or deterioration.
4. Complete inspection requirements listed in GSS 0.11.04.
5. Inspect skylights, if applicable.

INSPECTION ACTIONS

Based on results of GSS 0.11.04 and/or as directed, proceed to non-standard inspections. Points include:

1. The three non-destructive methods employed for defining cracks or leaks in roof specialties include capacitance metering, nuclear metering, and infrared scanning (aerial or surface). Perform infrared scans at night for most accurate readings. Test skylights in conjunction with the roof system, if applicable.
2. X-Ray or Ultrasonic test welded joints on metal components to determine degree of deterioration and material thickness.
3. Perform Magnetic Particle or Dye Penetrant testing to test for surface flaws in material.
4. Perform an environmental data analysis to determine the effects of external conditions on the roof materials.

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: LOUVERS & VENTS
CONTROL NUMBER: GSNS 0.11.05

APPLICATION

This guide applies to all non-standard inspection procedures for Louvers and Vents.

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

inspect foundations and footings, substructure, exterior closure, and roofing for any other signs of damage or deterioration that may be related to louver and vent deficiencies.

INSPECTION ACTIONS

There are no non-standard inspection actions required for louvers and vents.

TOOLS & MATERIALS

Standard Tools - Basic

INSPECTION METHODS - NON-STANDARD

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INSPECTION METHODS - NON-STANDARD

GUIDE SHEET

SYSTEM/COMPONENT: ACCESS FLOORS
CONTROL NUMBER: GSNS 0.11.06

APPLICATION

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

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

Based on results of GSS 0.11.06 and/or as directed, proceed to non-standard inspections. Points include:

1. Have a trained specialist test for vinyl asbestos tile in older buildings.
2. Wood: Perform a Pick test to determine the degree of deterioration, decay, or rot.

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: INTEGRATED CEILINGS
CONTROL NUMBER: GSNS 0.11.07

APPLICATION

This guide applies to all non-standard inspection procedures for Integrated Ceilings,

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. Complete inspection requirements listed in GSS 0.11.07.

INSPECTION ACTIONS

Based on results of GSS 0.11.07 and/or as directed, proceed to non-standard inspections. Points include:

1. Most ceiling damage can be traced to water penetration or leaks that can be traced to a number of sources (roof, plumbing, steam line, etc.). If sources of water damage cannot be traced, non-standard inspection test methods may be required. 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 because water leakage may have damaged reinforcing steel.
2. If ceiling system is located in an area exposed to varied environmental conditions, conduct an environmental test to determine if elements of this environment may be causing damage to ceiling systems.
3. If ceiling system has wood members, perform a Pick test to determine degree of deterioration or rot.

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: MEZZANINE STRUCTURES
CONTROL NUMBER: GSNS 0.11.08

APPLICATION

This guide applies to all non-standard inspection procedures for Mezzanine Structures.

SPECIAL INSTRUCTIONS

1. Review as-builts and other historical documentation prior to initiating the inspection.
2. Observe established safety procedures during the inspection.
3. This is a general inspection, deficiencies should be handled on a service call or repair basis.
4. Review any warranties for special requirements.

CONCURRENT ACTIONS

1. Inspect floors. (GSS 0.03.03)
2. Inspect substructure and superstructure for any signs of damage or deterioration that may be related to mezzanine deficiencies.

INSPECTION ACTIONS

Based on the results of GSS 0.11.08 and/or as directed, proceed to non-standard inspections. Points include:

1. X-Ray or Ultrasonic test welded joints on metal components to determine degree of deterioration and material thickness.
2. Perform Magnetic Particle or Dye Penetrant to test for surface flaws.
3. Perform an environmental analysis to determine the effects of environmental conditions.
4. Perform a Pick test on wooden members to determine the degree of deterioration, rot, or decay.

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 (IU) 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)

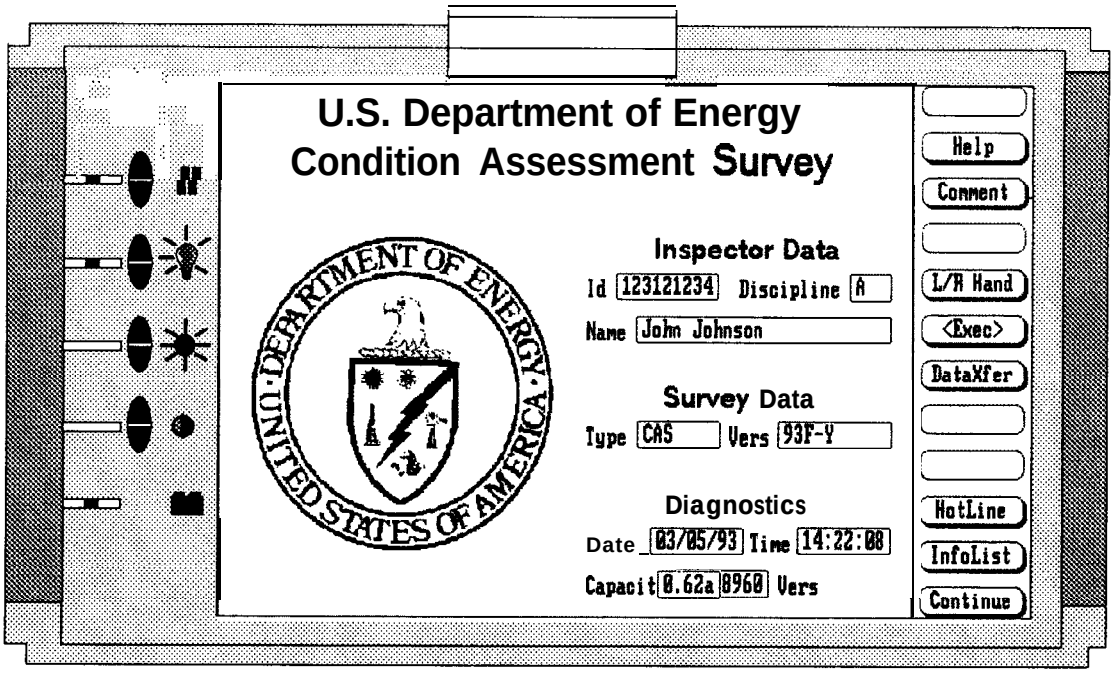
SURVEY STEP: SUMMARY CONDITION ASSESSMENT SCREEN 5.0

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.

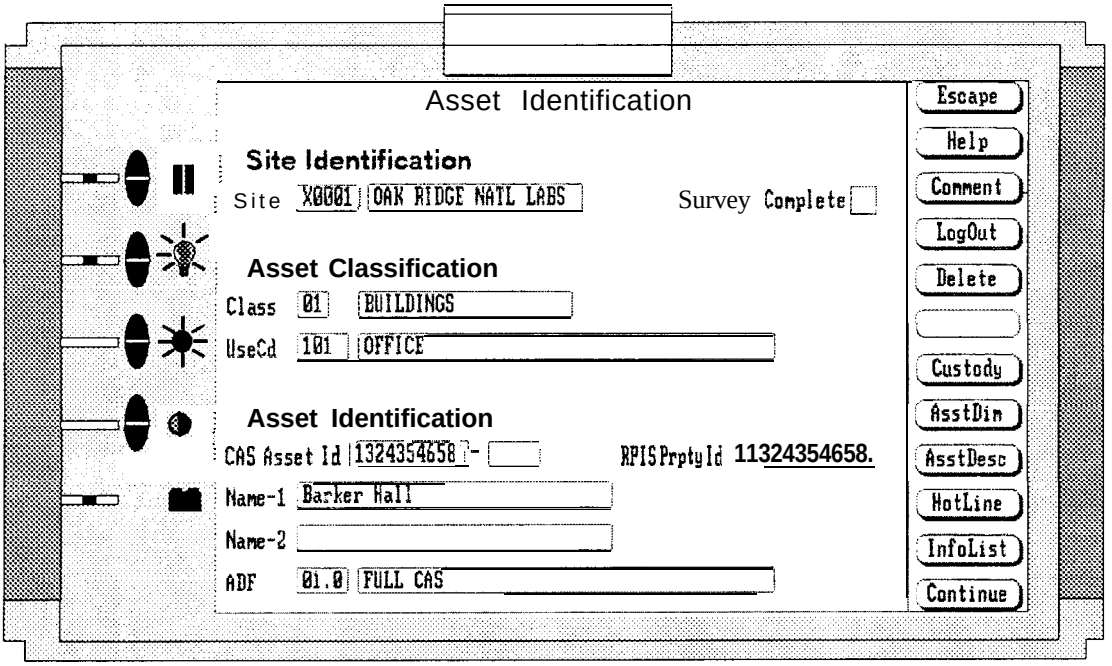
SURVEY STEP **LOGIN** Screen 1.0



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 cursor 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 2.0	[redacted] ade 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 992
(LH/RH)	Press to change screen between Left or Right Hand use	WA
(<Exec>)	Press to exit to the Grid System Menu	This option can be password protected
(DataXfer)	Press to transfer data to site canputer	Used for data upload/download procedures
(Hotline)	Press for important contacts and telephone numbers	Screen 99.3
(InfoList)	Press to bring up informatiidirectiins preloaded for inspector	Sawn 99.4

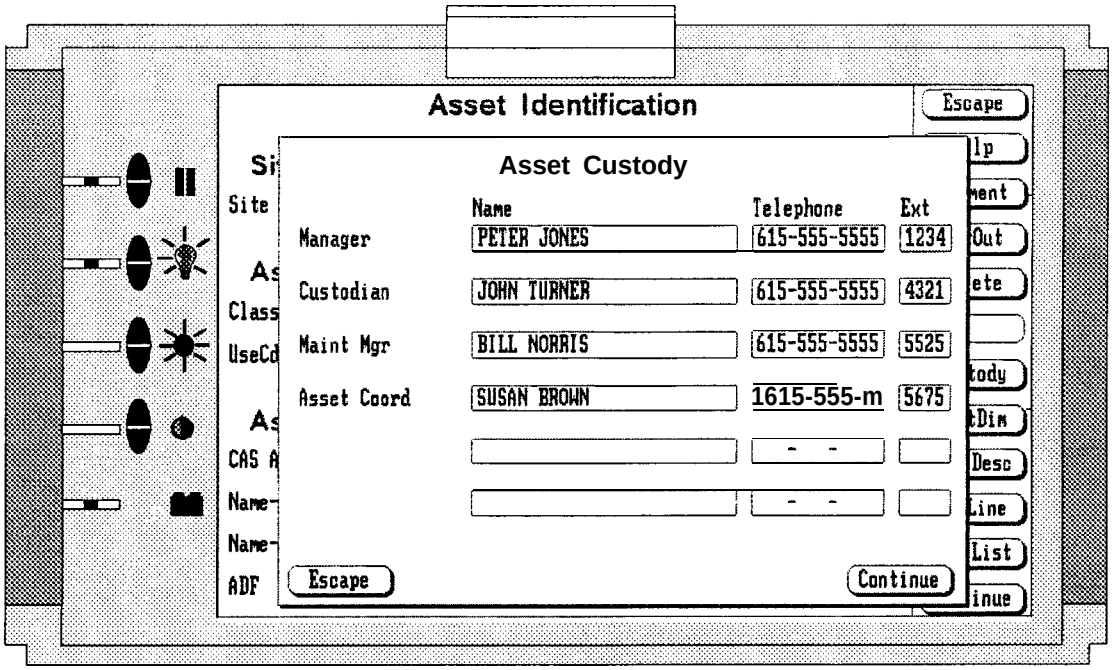
SURVEY STEP ASSET IDENTIFICATION

Screen 2.0



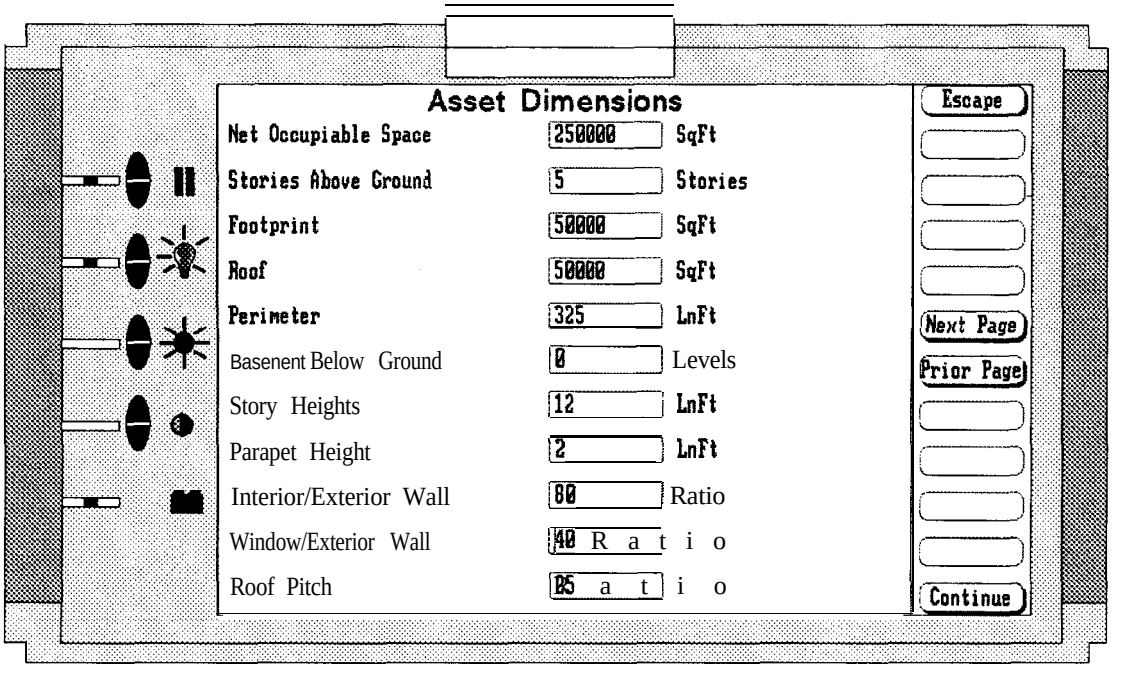
SCREEN	ACTION	COMMENT
2.0	1. Tap "Site" title for picklist Cursor select or enter by pen . .	Picklist can be preloaded, site code appears automatically to match name selected
	2. Tap "Class" title for picklist Cursor select or enter by pen or skip to item 4	Picklist preformatted based on RPIS categories
	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-1 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	This 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 .O	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 and 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/directions preloaded for inspector	Screen 99.4

SURVEY STEP ASSET CUSTODY SCREEN Screen 2.1



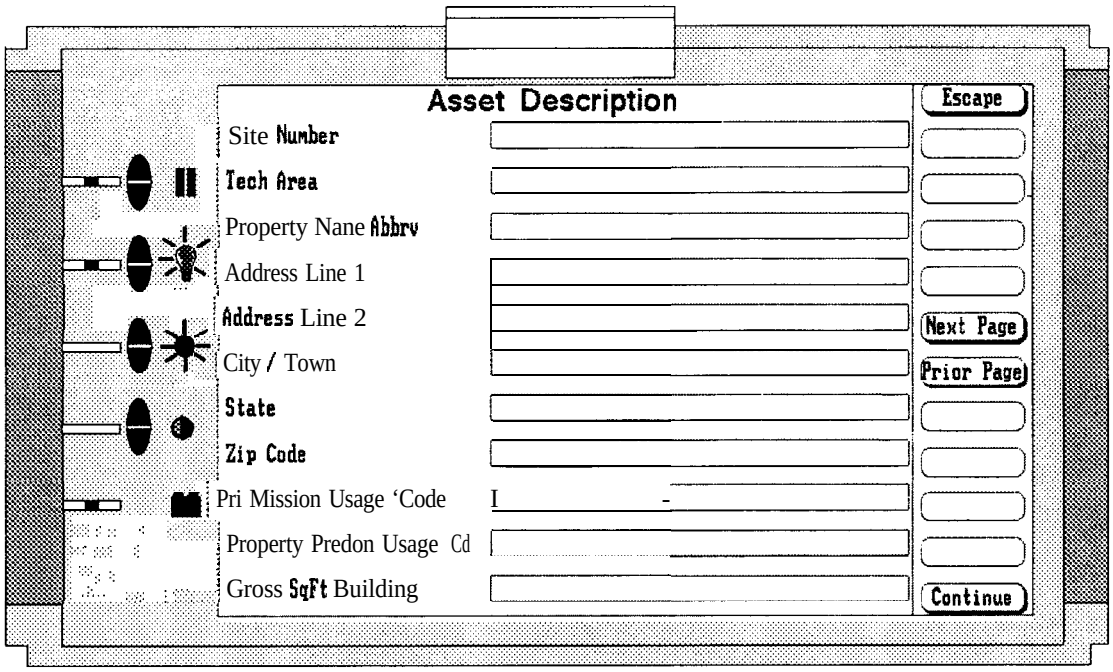
SCREEN	ACTION	COMMENT
2.1	1. Pop up window displays important names and numbers for asset. Cross through data and make any changes	Data can be either preloaded or inspector generated.
	2. Press (Continue) to return to Screen 2.0	By pressing (Continue) information is verified; corrections made by crossing 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.

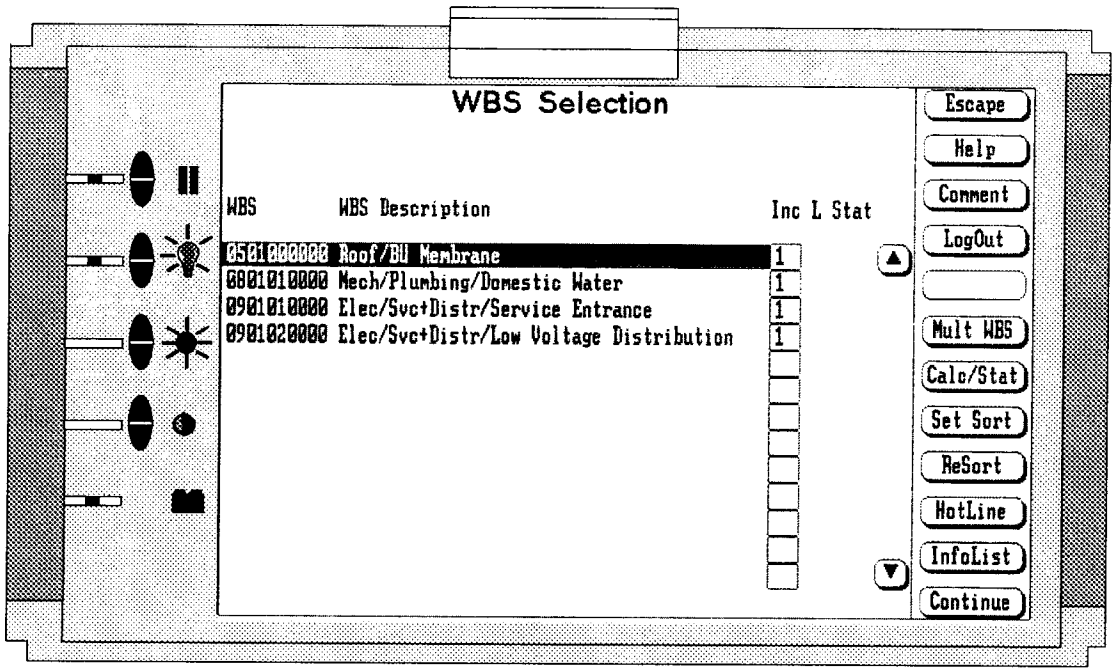
SURVEY STEP ASSET DESCRIPTION Screen 2.3



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

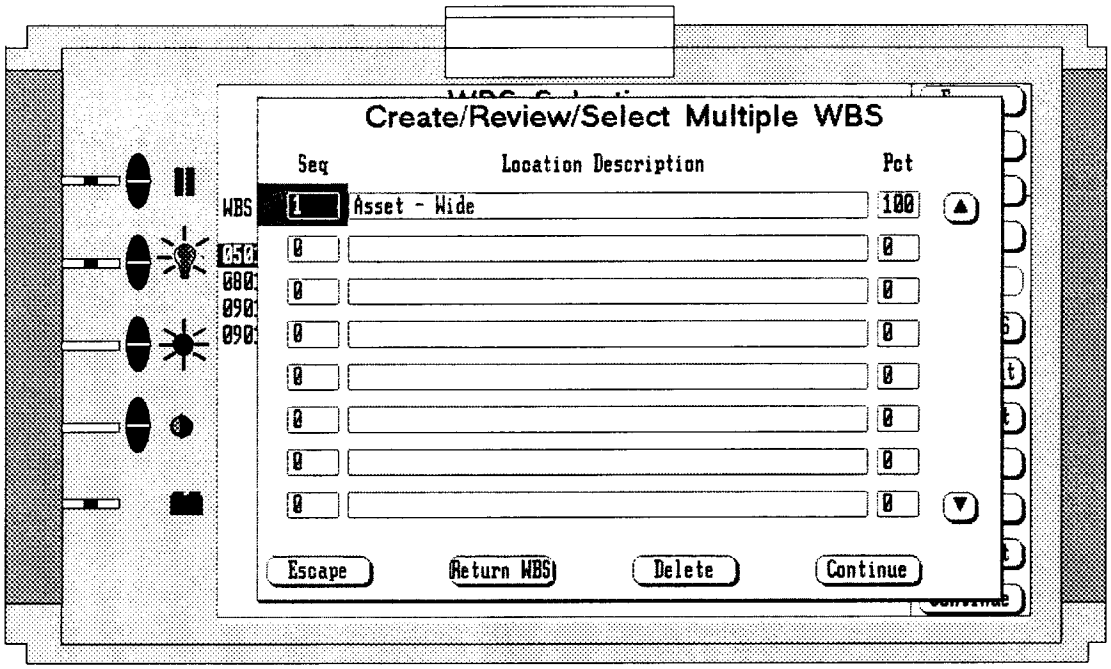
SURVEY STEP WBS SELECTION

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 re-calculate 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.

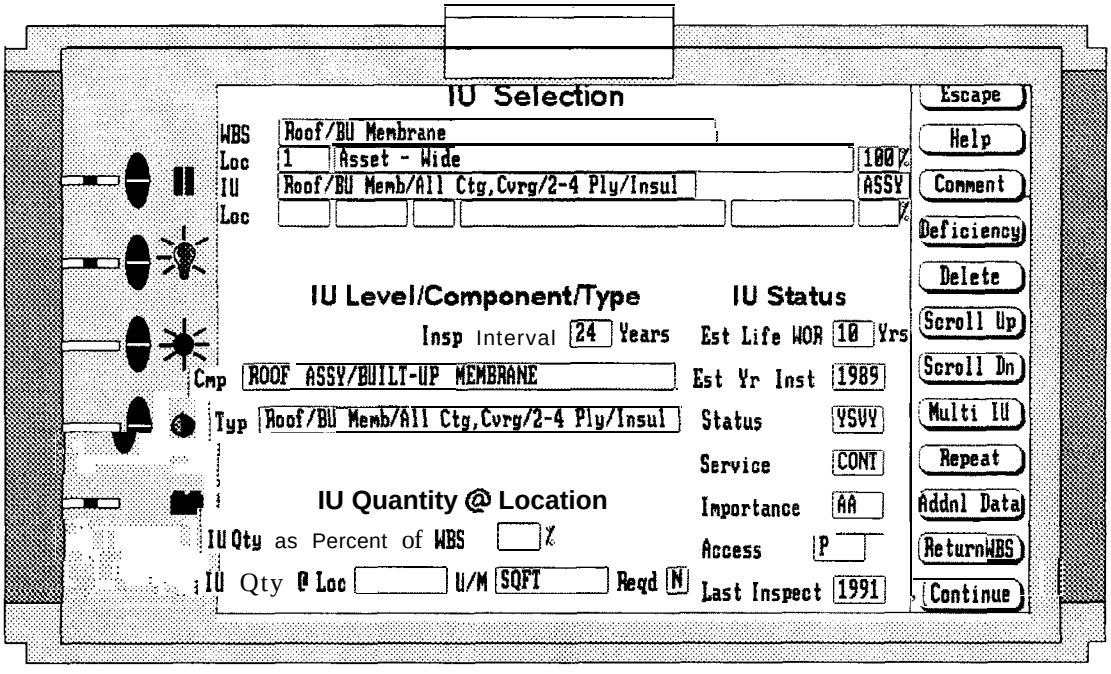
SURVEY STEP CREATE/REVIEW/SELECT MULTIPLE WBS Screen 3.1



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

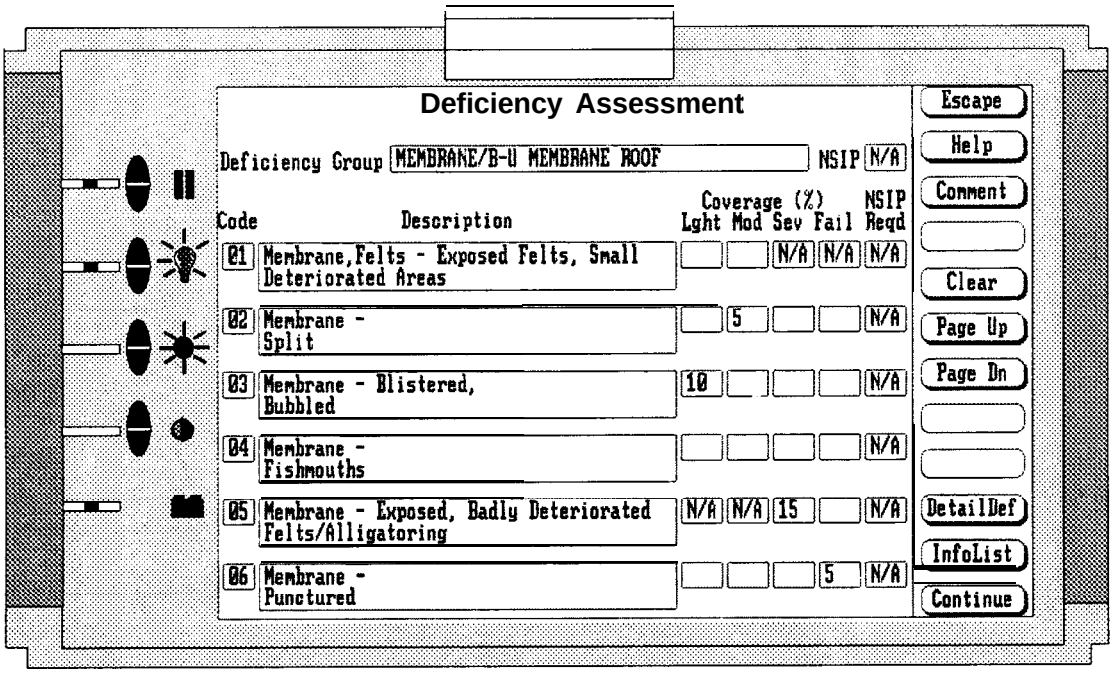
Screen 4.0



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

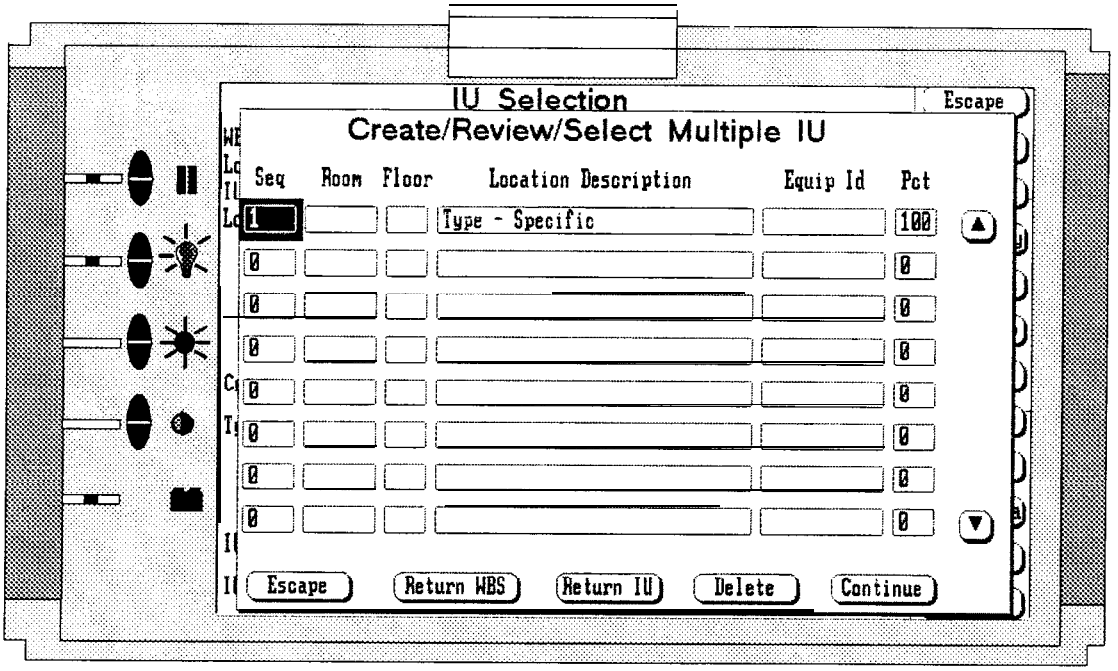
Screen 4.1



SCREEN	ACTION	COMMENT
4.1	1. Select deficiency from list	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 am 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

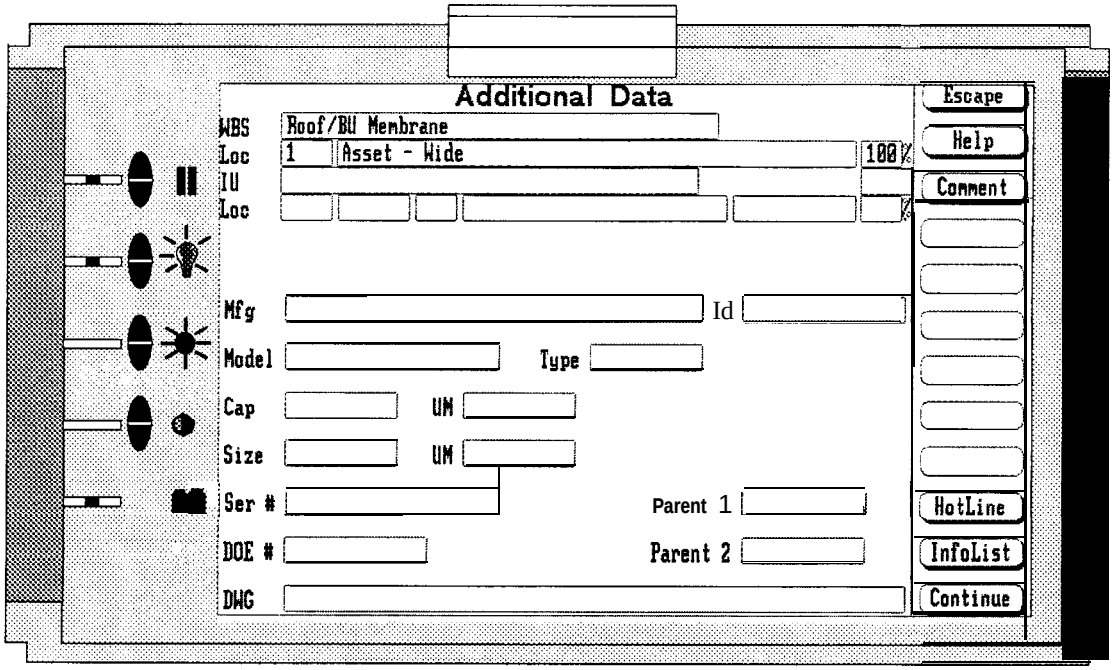
SURVEY STEP CREATE/REVIEW/SELECT MULTIPLE IU

Screen 4.2



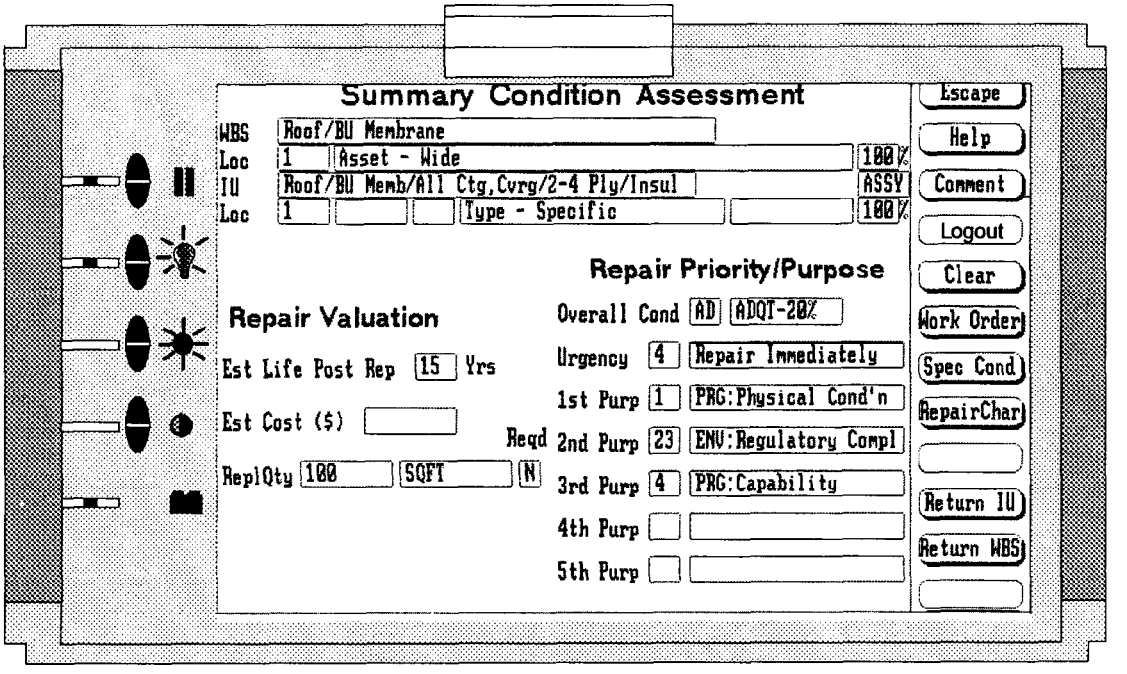
SCREEN	ACTION	COMMENT
4.2	1. Define locations of Multiple IU's by room, floor and/or location description - optional equipment identification number can be added	Inspector developed
	2. Define percentage of Asset or WBS serviced by IU	Inspector developed
	3. Press (Continue) after selecting Multiple 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

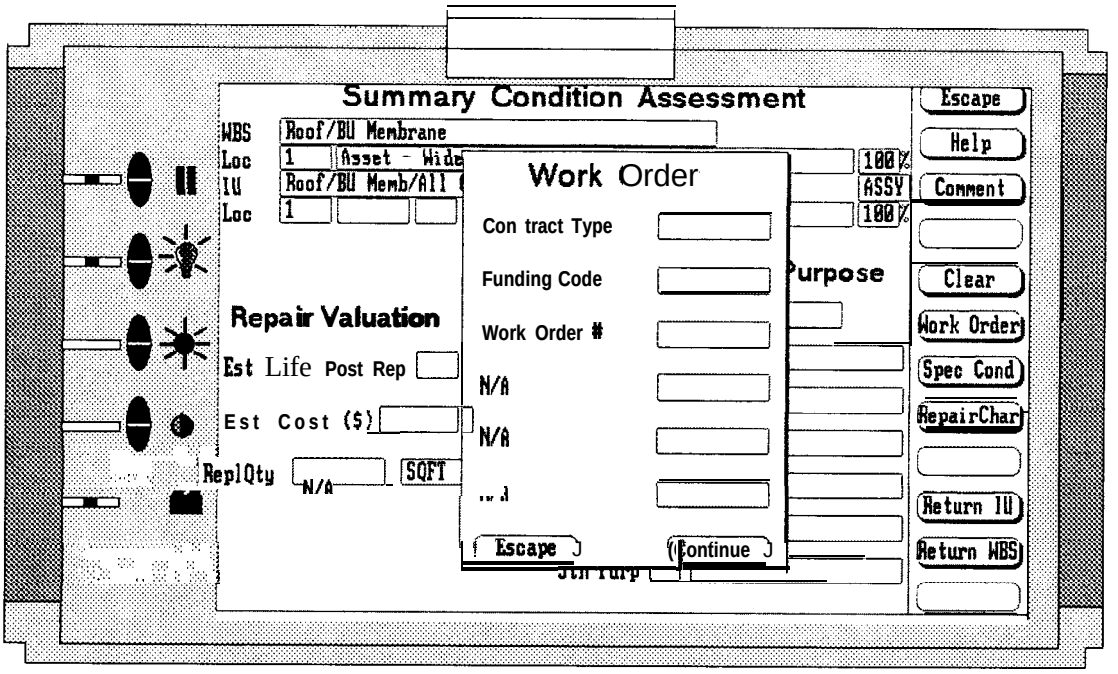
SURVEY STEP SUMMARY CONDITION ASSESSMENT Screen 5.0



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" title for picklist Cursor select or 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 IU 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 am 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

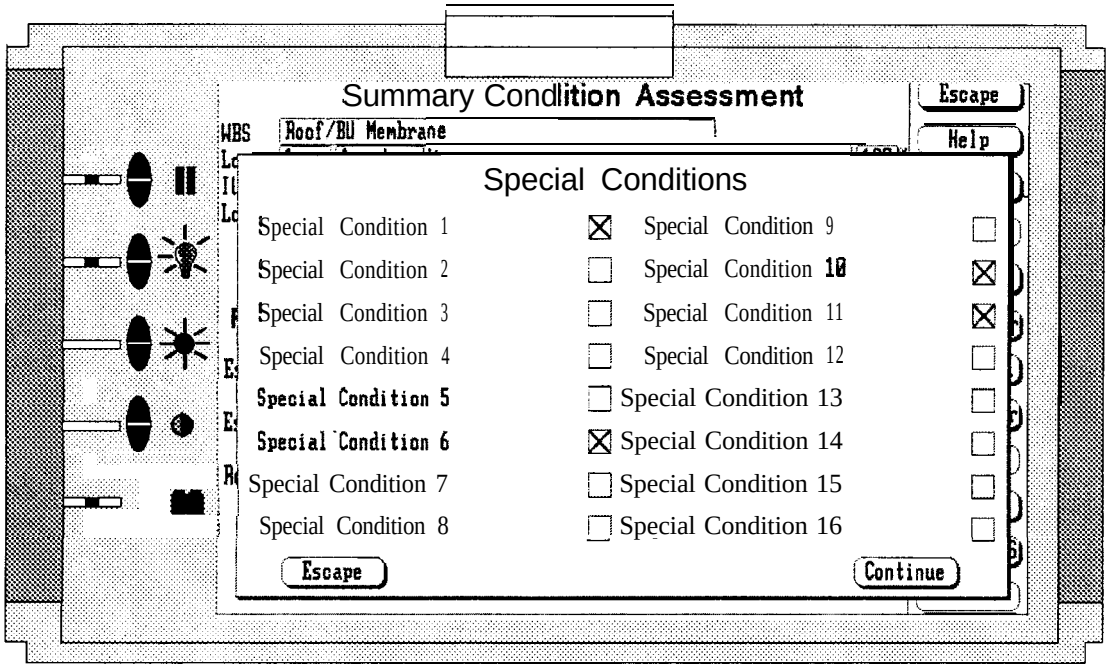
SURVEY STEP WORK ORDER GENERATION

Screen 5.1



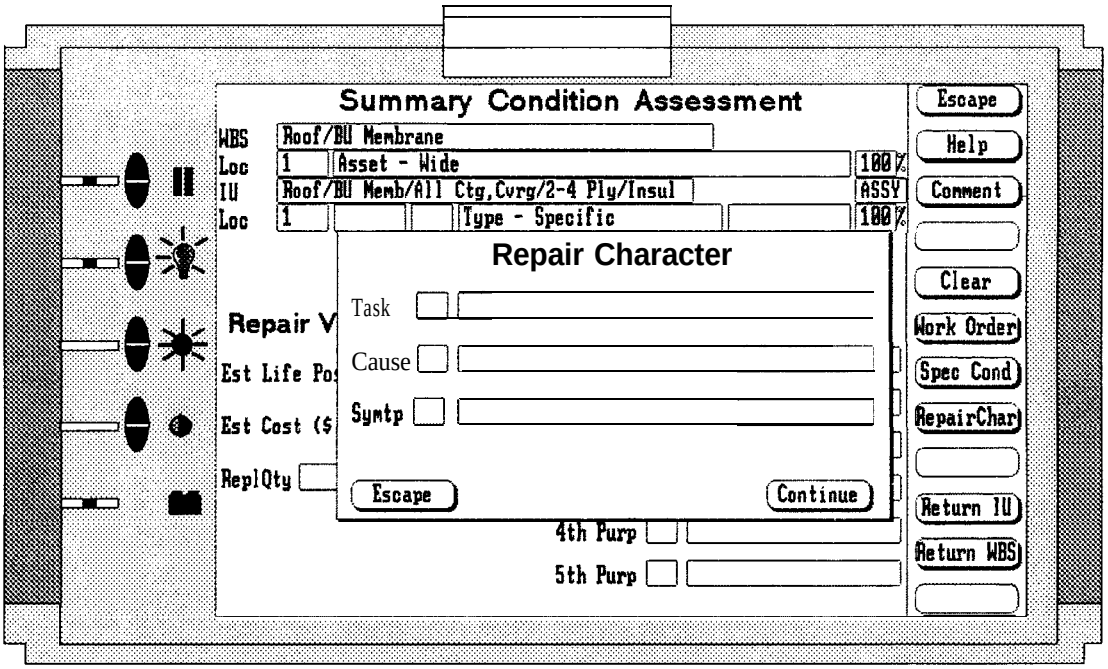
SCREEN	ACTION	COMMENT
5.1	1. Enter data to define Work Order number to tag repair to create a job estimate for repairs	Inspector generated as determined by Site Manager prior to survey
	2. Press (Continue) to go to Screen 5.0	By pressing (Continue) information is verified; corrections made by crossing 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

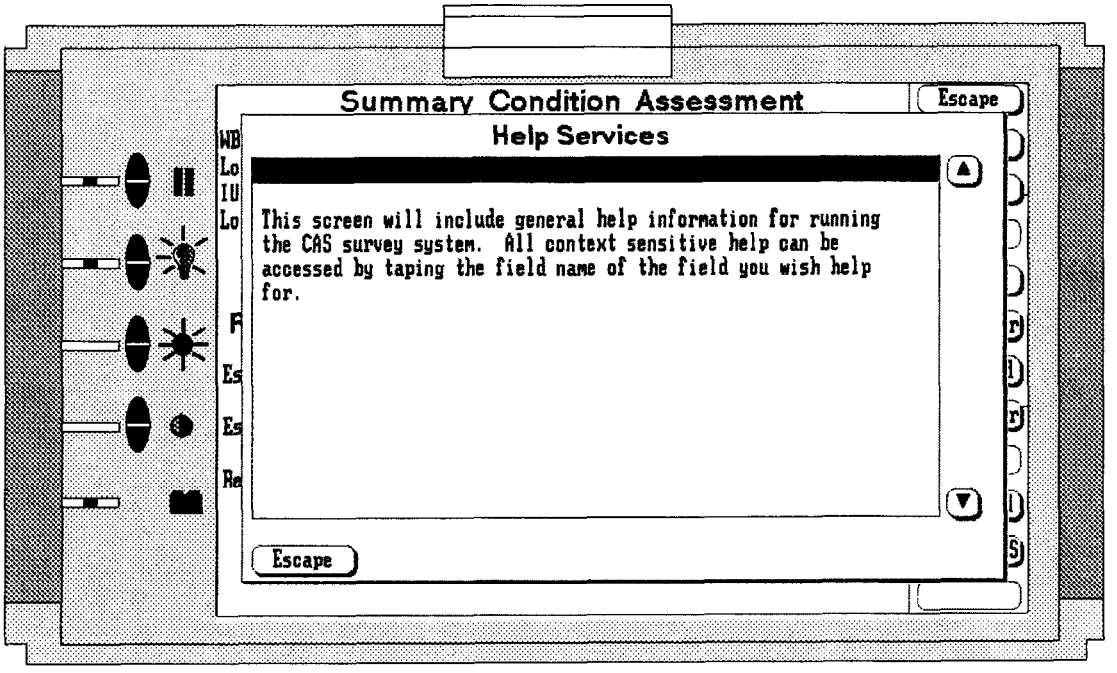
SURVEY STEP REPAIR CHARACTER DOCUMENTATION Screen 5.3



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

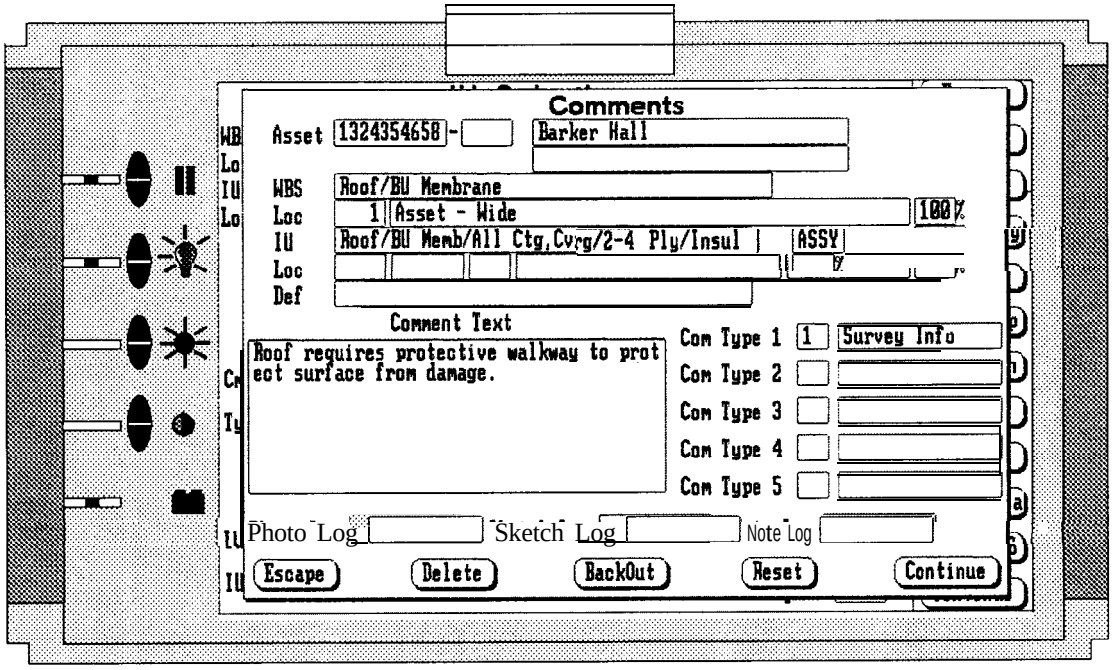
Screen 99.1



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

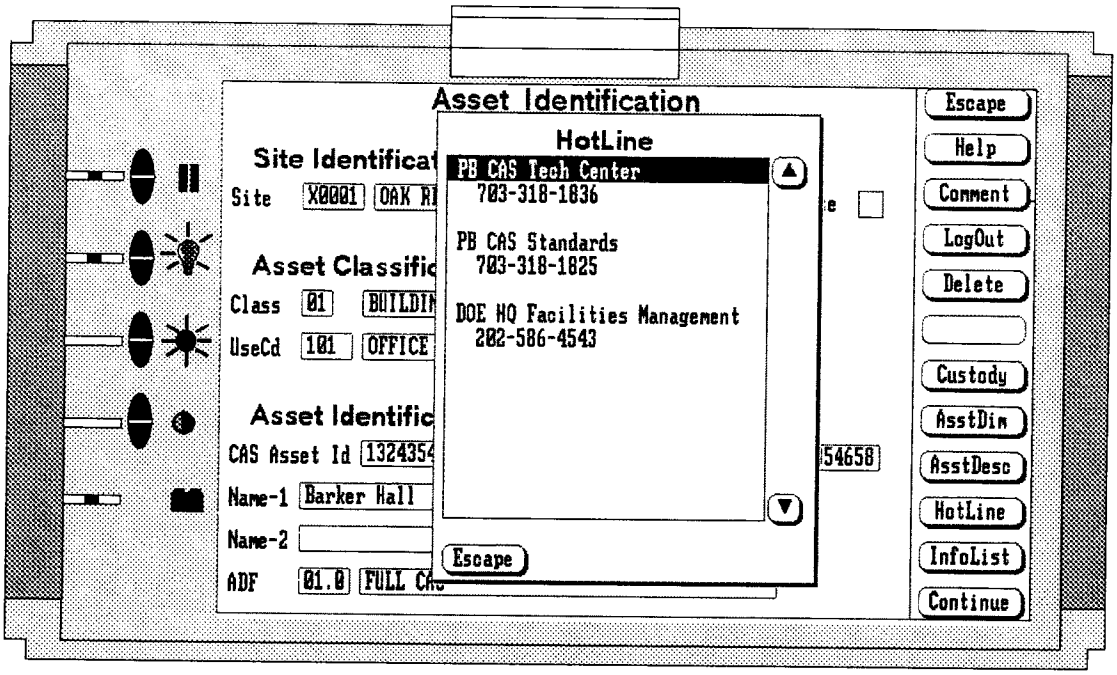
Screen 99.2



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- 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

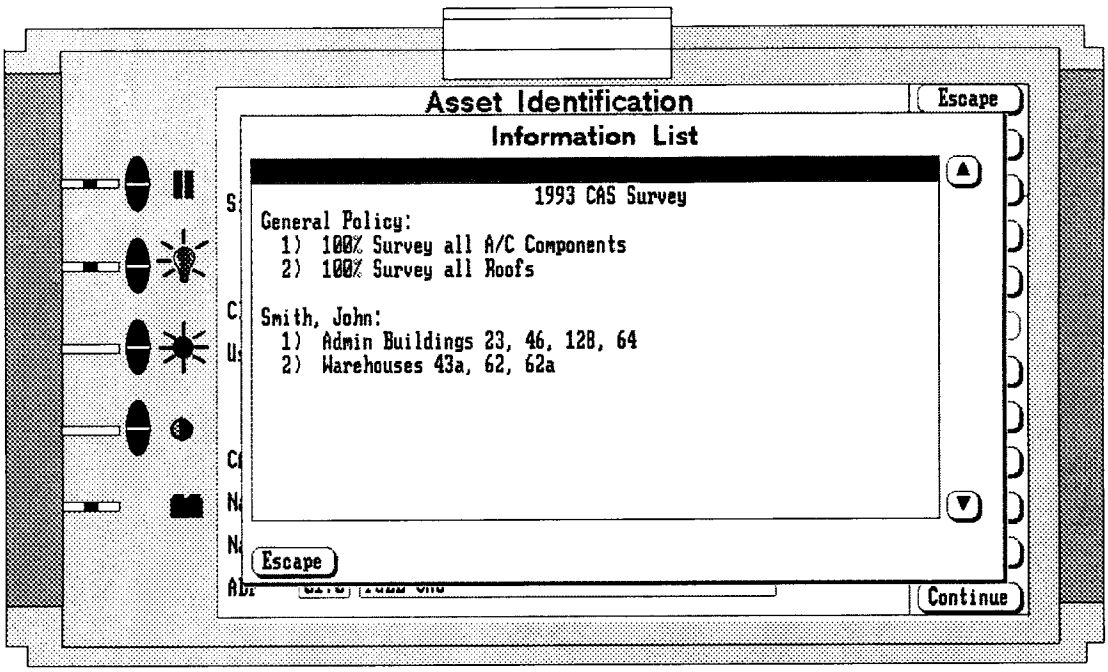
Screen 99.3



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
FEDSTD 66	Steel, Chemical Composition, and Hardening Ability
FED-STD 191A-5134.1	Strength of Cloth, Tearing, Tongue Method
FED STD **191A-5306**	Abrasion Resistance of Cloth; Rotary Platform, Double Head (Taber) Method
FS **FF-H-106**	Hardware, Builders Locks and Door Trim
FS **FF-H-1819**	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-I-1972/GEN**	Insulation Board, Thermal, Faced, Polyurethane or Polyisocyanurate
FS **HH-I 1972/1**	Insulation Board, Thermal, Polyurethane or Polyisocyanurate, Faced with Aluminum Foil on Both Sides of the Foam
FS **HH-I-1972/5**	Insulation Board, Thermal, Polyurethane or Polyisocyanurate Faced with Perlite Board to Both Sides of the Foam
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 **QQ-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-T-312B**	Tile, Floor Asphalt, Rubber, Vinyl, and Vinyl Composition
FS **SS-W-40A**	Wall Base: Rubber and Vinyl Plastic
FS **TT-C-490**	Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings
FS **TT-C-494**	Coating Compound, Bituminous, Solvent Type, Acid Resistant
FS **TT-C-498**	Coating Compound, Bituminous, Fillers, Solvent Type, Aluminum Pigmented
FS l-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 **TT-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-1796**	Caulking Compounds, Metal Seam and Wood Seam
FS **TT-F-1098**	Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, etc.)

FEDERAL SPECIFICATIONS

FEDERAL SPECIFICATION	TITLE
FS I-I-I-735	Isopropyl Alcohol
FS **TT-P-31**	Paint, Oil: Iron-Oxide, Ready-Mixed, Red and Brown
FS **TT-P-38**	Paint, Aluminum (Ready-Mixed)
FS **TT-P-59**	Paint, Ready Mixed, International Orange (Not for Residential Use)
FS I-r-P-85	Paint, Traffic and Airfield Marking, Solvent Base
FS TT-P-86	Paint, Red-Lead-Base, Ready-Mixed
FS I-r-P-95	Paint, Rubber: for Swimming Pools and Other Concrete and Masonry Surfaces
FS **TT-P-1** 02	Paint, Oil, Alkyd Modified, Exterior, White and Tints
FS T-r-P-1 10	Paint, Traffic Black (Nonreflectorized)
FS **TT-P-1** 15	Paint, Traffic, (Highway, White, and Yellow)
FS I-r-P-320	Pigment, Aluminum, Powder and Paste for Paint
FS I-r-P-815	Primer Coating: Basic Lead Silico Chromate, Ready Mixed
FS I-r-P-841	Primer, Paint Coating, Zinc Dust-Zinc Oxide for Galvanized Surfaces
FS I-r-P-845	Primer, paint, Zinc-Chromate, Alkyd Type
FS I-r-P=884	Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, Not-Complaint
FS I-r-P-00791	Putty, Linseed-Oil Type, (For Wood-Sash-Glazing)
FS **TT-P-141** 1	Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls)
FS **TT-P-1952**	Paint, Traffic and Airfield Marking, Water Emulsion Base
FS **TT-R-266**	Resin, Alkyd, Solutions
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 Compound, Elastomeric Type, Single Component for Caulking, Sealing, and Glazing (for Buildings and Other Structures)
FS **TT-S-001543**	Sealing Compound: Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures)
FS **TT-S-001** 857	Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type (for Buildings and Other Types of Construction)
FS **TT-T-291**	Thinner, Paint, Mineral Spirits, Regular and Odorless
FS I-r-v-51	Varnish, Asphalt
FS I-r-v-81	Varnish, Mixing, for Aluminum Paint
FS I-r-v-85	Varnish, Oil, (Low Sheen, Brush or Spray Application)
FS I-r-v-1 19	Varnish, Spar, Phenolic-Resin
FS I-r-v-1 21	Varnish, Spar, Water Resisting
FS I-r-w-00571	Wood Preservation: Treating Practices
FS IT-W-572	Wood Preservative: Water-Repellent
FS UU-B-790	Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant)
FS UU-P-288	Paper, Kraft, Wrapping
FS **UU-P-270**	Paper, Wrapping, Waxed (Dry)
HH-I-524C	Insulation Board, Thermal (Polystyrene)
HH-I-526C	Insulation Board, Thermal (Mineral Fiber)
HH-I-529B	Insulation Board, Thermal (Mineral Aggregate)
HH-I-551 E	Insulation Block, Pipe Covering and Boards, Thermal (Cellular Glass)
HH-I-1972	Insulation Board, Thermal, Faced, Polyurethane or Polyisocyanurate

FEDERAL SPECIFICATIONS

FEDERAL SPECIFICATION	TITLE
LLL-I-535	Insulation Board, Thermal (Cellulosic Fiber) Blocks
SS-C-450A	Cloth, Impregnated (Woven Cotton Cloth, Asphalt Impregnated, Coal-Tar Impregnated)
USCE CRD-CI3	Test for Evaluation of Air-Entraining Admixtures for Concrete
USCE **CRD-C109**	Field Test for Absorption by Aggregates
USCE **CRD-C119**	Test for Flat and Elongated Particles in Coarse Aggregates
USCE **CRD-C129**	Test for Particles of Low Specific Gravity in Coarse Aggregate (Sink-Float Test)
USCE **CRD-C213**	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
USCE CRD **C400**	Requirements for Water for Use in Mixing or Curing Concrete

FEDERAL SPECIFICATIONS

END OF SUBSECTION

NATIONAL STANDARDS

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 603	Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum
AAMA 605.2	Voluntary Specification for High Performance Organic Coatings on Architectural Extrusions and Panels
AAMA 606.1	Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum
AAMA 607.1	Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum
AAMA 608.1	Voluntary Guide Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum

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 OF MECHANICAL ENGINEERS **(ASME)**

ASME MH 141	American National Standard Loading Dock Levelers and Dockboards

AMERICAN SOCIETY FOR TESTING **&** MATERIALS (ASTM)

ASTM A36	Specification for Structural Steel
ASTM A82	Steel Wire, Plain, for Concrete Reinforcement
ASTM **A90**	Tests for Weight of Coating on Zinc-Coated(Galvanized) Iron or Steel Articles
ASTM **A121**	Zinc Coated(Galvanized) Steel Barbed Wire

NATIONAL STANDARDS

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM AI23	Zinc (Hot Galvanized)Coatings on Products, Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip
ASTM Al 84	Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM AI85	Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A370	Mechanical Testing of Steel Products
ASTM A382	Zinc Coated Steel Chain Link Fence Fabric
ASTM A418	Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
ASTM A421	Uncoated Stress-Relieved Wire for Prestressed Concrete
ASTM A428	Tests for Weight of Coating on Aluminum-Coated Iron or Steel Articles
ASTM **A491**	Aluminum-Coated Steel Chain Link Fabric
ASTM **A496**	Steel Wire, Deformed, for Concrete Reinforcement
ASTM A487	Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A528	Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A527	Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
ASTM A570	Hot Rolled Sheet and Strip, Structural Quality
ASTM A572	High Strength Low-Alloy Columbium-Vanadium Steel of Structural Quality
ASTM A585	Aluminum-Coated Steel Barbed Wire
ASTM A815	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A81 7	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A787	Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM **A780**	Practice for Repair of Damaged Hot-Dip Galvanized Coatings
ASTM A824	Metallic-Coated Steel Marcelled Tension Wire
ASTM B8	Specification for Zinc (Slab Zinc)
ASTM **B85**	Specification for Aluminum-Alloy Die Castings
ASTM **B209**	Specification for Aluminum-Alloy Sheet and Plate
ASTM 8221	Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
ASTM **C5**	Quicklime for Structural Purposes
ASTM C8	Specification for Normal Finishing Hydrated Lime
ASTM C28	Unit Weight and Voids in Aggregate
ASTM **C31**	Making and Curing Concrete Test Specimens in the Field
ASTM **C33**	Concrete Aggregates
ASTM C38	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
ASTM **C94**	Ready-Mixed Concrete
ASTM **C109**	Compressive Strength of Hydraulic Cement Mortars
ASTM CI 14	Chemical Analysis of Portland Cement
ASTM CI 15	Fineness of Portland Cement by the Turbidimeter
ASTM CI 17	Materials Finer Than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM CI23	Lightweight Pieces in Aggregate
ASTM CI25	Concrete and Concrete Aggregates
ASTM CI27	Specific Gravity and Absorption of Coarse Aggregate

NATIONAL STANDARDS

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM CI28	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 CI38	Sieve Analysis of Fine and Coarse Aggregates
ASTM CI41	Hydraulic Hydrated Lime for Structural Purposes
ASTM CI43	Slump of Hydraulic Cement Concrete
ASTM CI50	Portland Cement
ASTM C151	Autoclave Expansion of Portland Cement
ASTM CI58	Water Retention by Concrete Curing Materials
ASTM CI71	Sheet Materials for Curing Concrete
ASTM CI72	Sampling Freshly Mixed Concrete
ASTM CI83	Sampling and the Amount of Testing of Hydraulic Cement
ASTM CI84	Test for Fineness of Hydraulic Cement by the No. 100 and No. 200 Sieves
ASTM CI88	Heat of Hydration of Hydraulic Cement
ASTM CI87	Test for Normal Consistency of Hydraulic Cement
ASTM CI88	Density of Hydraulic Cement
ASTM CI80	Tensile Strength of Hydraulic Cement Mortars
ASTM CI91	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 C228	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 C260	Air-Entraining Admixtures for Concrete
ASTM C285	Test for Calcium Sulfate in Hydrated Portland Cement Mortar
ASTM C288	Time of Setting of Hydraulic-Cement by Gillmore Needles
ASTM C287	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 C485	Specification for Processing Additions for Use in Manufacture of Hydraulic Cements
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM C535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C552	Cellular Glass Block and Pipe Thermal Insulation
ASTM C578	Preformed, Cellular Polystyrene Thermal Insulation
ASTM C595	Blended Hydraulic Cements
ASTM C612	Specification for Mineral Fiber Block Thermal Insulation
ASTM C728	Mineral Fiber and Mineral Fiber, Rigid Cellular Polyurethane Composite Roof Insulation Board
ASTM C728	Perlite Thermal Insulation Board

NATIONAL STANDARDS

AMERICAN SOCIETY FOR TESTING & MATERIALS (ASTM)

ASTM **C851**	Recommended Practice for Estimating Scratch Hardness of Coarse Aggregate Particles
ASTM C984	Perlite Board, Rigid Cellular Polyurethane Composite Roof Insulation
ASTM CI050	Rigid Cellular Polyurethane Composite Roof Insulation
ASTM D41	Asphalt Primer Used in Roofing, Dampproofing and Waterproofing
ASTM **D43**	Creosote Primer Used in Roofing, Dampproofing and Waterproofing
ASTM D75	Sampling Aggregates
ASTM D98	Calcium Chloride
ASTM D224	Smooth-Surfaced Asphalt Roll Roofing (Organic Felt)
ASTM D228	Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D227	Coal-Tar-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D249	Asphalt Roll Roofing (Organic Felt) Surfaced with Mineral Granules
ASTM D312	Asphalt Used in Roofing
ASTM **D450**	Coal-Tar Pitch Used in Roofing, Dampproofing and Waterproofing
ASTM **D1079**	Definition of Terms Relating to Roofing, Waterproofing and Bituminous Materials
ASTM **D1327**	Bitumen-Saturated Woven Burlap Fabrics Used in Roofing and Waterproofing
ASTM D1888	Glass Fabrics (Woven and Treated) for Roofing and Waterproofing
ASTM 02178	Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM **D2626**	Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing
ASTM D2859	Test Method for Flammability of Finished Textile Floor Covering Material
ASTM **D3672**	Venting Asphalt-Saturated and Coated Inorganic Felt Base Sheet Used in Roofing
ASTM **E11**	Wire Cloth Sieves for Testing Purposes
ASTM E84	Test Method for Surface Burning Characteristics of Building Materials
ASTM **E90**	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
ASTM **E336**	Measurement of Airborne Sound Insulation in Buildings
ASTM E413	Classification for Determination of Sound Transmission Class
ASTM **E514**	Water Penetration and Leakage Through Masonry
ASTM **E515**	Leaks Using Bubble Emission Techniques
ASTM E848	Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

AMERICAN WOOD-PRESERVERS ASSOCIATION (AWPA)

AWPA CI **-90**	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-90	The BOCA National Plumbing Code

NATIONAL STANDARDS

DOOR & HARDWARE INSTITUTE (DHI)

DHI 02	installation Guide for Doors and Hardware
DHI 08	Basic Architectural Hardware
DHI A115	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 ASSN OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

1988 Edltlon	Metal Finishes Manual for Architectural and Metal Products

PORTLAND CEMENT ASSOCIATION (PCA)

PCA	Specifications for Plain and Reinforced Concrete
PCA	Architectural Concrete Specifications

SHEET METAL & AIR CONDITIONING CONTRACTORS NATL ASSN, INC. (SMACNA)

1987 Edition	Architectural Sheet Metal Manual

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC PAINT 12	Paint Specification No. 12 - Cold-Applied Asphalt Mastic (Extra Thick Film)
SSPC PAINT 20	Paint Specification No. 20 - Zinc-Rich Primers (Type I, “Inorganic”, and Type II “Organic”)
SSPC **PA1**	Shop, Field, and Maintenance Painting

NATIONAL STANDARDS

END OF SUBSECTION

INDUSTRY PUBLICATIONS

PUBLICATION	PUBLISHER
ACI Detailing Manual and Structural Concrete for Buildings	American Concrete Institute P.O. Box 19150 Detroit, MI 48219-0150
ASTM Standards in Building Codes	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
FM Approval Guide and FM Loss Prevention Data Sheets	Factory Mutual Research Nor-wood. MA 02062
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
Landscape Design for Sun and Wind Control	American Association of Nurserymen 200 Southern Building Washington, D.C. 20005
Masterspet	American Institute of Architects 1735 New York Ave N.W. Washington, D.C. 20006
UL Building Materials Directory	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062

INDUSTRY PUBLICATIONS

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OTHER RELATED REFERENCES

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ACI Manual of Concrete Inspection, Detroit, MI. American Concrete Institute.

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Time-Saver Standards. McGraw-Hill, New York, NY.

Magazine Articles:

Annual Checkups Maintain Crack Repairs. Parking Technology. July 1991.

Carpet Tiles are a Natural for Access Floors and Flat Wire. Facilities Design & Management. May 1985.

Minimizing Concrete Surface Abrasion. Plant Engineering. July 3, 1991.

Performance of Portland Cement, The. ASTM Standardization News. January 1992.

Power to the People: Access or Ducted System? Facilities Design & Management. April 1985.

Wiring for Flexibility: Access Flooring. Corporate Design & Realty. March 1987.

Writing the Automated Office. Office Administration and Automation. September 1985.

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	US. 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

APPENDIX A

AWS	American Welding Society
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
C C N	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

APPENDIX A

CYL	Cylinder
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
Equip	Equipment
ERDA	Energy Research and Development Administration (precursor toDOE)
ESF	Engineered Safety Feature

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Est	Estimated
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
Fixt	Fixture
Flr	Floor
FM	Factory Mutual
Fndtn	Foundation
FPM	Feet Per Minute
FPT	Female Pipe Thread
CR	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

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HVAC	Heating, Ventilating, and Air-Conditioning
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

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LV	Low Voltage
MA	Management and Administration (U.S. DOE)
mA	milliAmpre
MAA	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
mln	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
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

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NEC	National Electrical Code
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)
N O M	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 tnformation 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
o c	On Center
o c s	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
o s s	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

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PCB	Polychlorinated biphenyls
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
s c s	U.S. Department of Agriculture, Soil Conservation Service
SDI	Steel Deck Institute, Steel Door Institute

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SDWA	Safe Drinking Water Act
SF	Safety Factor
SGFT	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	Singte 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

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UEU	Unirradiated Enriched Uranium
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

APPENDIX B

GLOSSARY

Abrasion Resistance:	A coating's ability 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.
Accelerated Weathering:	A test designed to simulate, but at the same time intensify and accelerate, the destructive action of natural outdoor weathering.
Accelerator:	A substance used in small proportions to increase the speed of a chemical reaction. Accelerators are often used in the paint industry to hasten the curing of a coating system and concrete to speed natural setting.
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 the underlying material it is in contact with.
Admixture:	Act of mixing, or the compound formed by mixing different substances together.
Adsorption:	Process of attraction or attachment to a surface. The retention of foreign molecules on a substance surface.
Air Entrapment:	The inclusion of air bubbles in liquid paint or a paint film.
Alkali:	An aqueous liquid that has a pH value of between 7 and 14. A base or caustic material.
Alkyd Resin:	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 Temperature:	Room temperature or temperature of surroundings.
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:	A piece or connected pieces of metal used to tie together two or more masonry material pieces.
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 arranged over an opening so that the supported load is resolved into pressures on the side supports and practically normal to their faces.

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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.
Asphalt:	Black resinous material of petroleum origin.
Backfill:	Replacing excavated earth into a trench around and against a basement foundation.
Backfilling:	(1) Earth, soil, or other material used to replace excavated materials around a newly constructed wail; (2) rough masonry laid behind a facing or between two faces; (3) brickwork laid in the space between structural timbers.
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 to increase adhesion or ensure compatibility.
Base Plate:	See Bearing Plate.
Beam:	A structural member transversely supporting a load.
Bearing:	The part of a lintel, beam, girder, or truss, that rests on a column, pier, or wall.
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.
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 pigment particles together.
Bituminous Coating:	A coal, tar, or asphalt-based coating material often used in thick films.
Blast Profile:	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 an underlying surface coating causing a color change.
Blistering:	The formation of blisters in paint films by the local loss of adhesion lifting the film from the underlying substrate.
Blooming:	A haziness that develops on paint surfaces 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 excessive moisture presence during the curing process.

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Bonding:	The attachment between a coating film and the underlying material it is applied to.
Bounce Back:	The rebound of atomized paint, especially when applied by conventional air spray methods.
Bridging:	The formation of a paint film over a depression.
Brittleness:	The lack of resistance to cracking or breaking of a paint film when bent or flexed.
Bubbling:	A temporary or permanent film defect in which bubbles of air or solvent vapor are present in the applied film.
Build:	The wet or dry thickness of a coating film.
Bull Nose:	Convex rounding of a member, such as the front edge of a stair tread or window sill.
Camber:	A slight upward curve of a structural member so that it becomes horizontal, or nearly so, when loaded.
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, which in the corrosion process, is protected and not attacked.
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.
Caulking:	The operation or method of rendering a joint tight against water using plastic substances such as oakum and pitch, elastic cement, etc.
Caustic:	A strong base or alkaline material.
Caustic Soda:	A common name for sodium hydroxide, a strong base or alkali.
Cementitlous Coatings:	A coating containing Portland cement as one of its components, held on the surface by a binder.
Centipoise:	One hundredth of a poise, a unit of measurement for viscosity. Water at room temperature has a viscosity of 1 .0 centipoise.
Chalking:	A friable powdery coating on the surface of a paint film, generally caused by exposure to ultraviolet radiation resulting in a loss of gloss.
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.

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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; 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.
Cobwebbing:	Premature drying of a coating during spraying causing a spider web effect.
Coheslon:	The forces that bind the particles of a paint film together into a continuous film.
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 1 00°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, etc., to protect the masonry below by throwing water off to one or more sides.
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.

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Corrosion:	The decay, oxidation, or deterioration of a substance due to interaction with the environment.
Cracking:	Splitting of a paint film usually as a result of aging.
Craters:	The formation of small bowl-shaped depressions in paint films.
Creep:	The time-dependent deformation of steel or concrete due to sustained load.
Cross Spraying:	Spraying the first pass in one direction and the second at a right angle to the first to provide more even film distribution.
Crown:	The top or high point of a horizontal surface.
Curtains:	Long horizontal runs in a coating film that occur on vertical surfaces when a coating is applied too heavily.
Damp Course:	A course or layer of impervious material in a wall or floor to prevent moisture entering from the ground or lower course.
Deformed Bars:	Reinforcing bars with closely spaced shoulders, lugs, or projections formed integrally with the bar during rolling to firmly engage the surrounding mortar. 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 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.
Destaling:	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.
Diluent:	A portion of the volatile components of a coating that is not a true solvent and has minimal affect on the viscosity.
Dispersion:	The suspension of tiny particles, usually pigments, in a liquid, usually resin.
Distilled Water:	Water purified by vaporizing the liquid and collecting the vapor, which is then condensed back to a liquid.

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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 Seam: Unhealed fracture, a plane of weakness.

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, etc.

Effervescence: An effect in the film caused by rapid solvent release. This "boiling" of solvent causes a pinholed or cratered appearance, reducing gloss.

Eggshelling: 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 has been removed.

Electrolyte: 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.

Enamel: A term used to characterize a coating that has a glossy smooth finish. A common term for alkyd coatings.

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: Treating a surface with an acid to dissolve loose particles or provide a profile.

Expanded Metal: Sheets of metal slit and drawn out to form diamond-shaped openings. This is used as a metal reinforcing for plaster and 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.

Exterior Wall: Any outside wall or vertical enclosure of a building other than a party wall.

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.

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Fan Pattern:	The geometry of a spray pattern.
Feather Edge:	Reduced film thickness at the edge of a dry paint film 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.
Fingering:	A broken spray pattern delivering heavier paint to one area than another.
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 to close openings to prevent the passage of fire.
Fireproofing:	Any material or combination of materials used to enclose structure members to make them fire resistant.
Fiammabie:	Any substance easily ignited in the presence of a flame; any liquid having a flash point below 100°F (37.8°C).
Flashing:	The material used and the process of making watertight the roof intersections and other exposed places on the outside of the structure.
Flexibility:	The degree to which a coating is able to conform to movement or deformation of its supporting surface without cracking or flaking.
Fluorescent:	A class of pigments that when exposed to visible light emit light of a different wave length, producing a bright appearance.
Foreign Thinner:	Any thinner not recommended on the label or in published literature of the manufacturer, which 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.
Galvanized Steel:	Cold rolled steel that has been coated with a thin layer of metallic zinc by hot dipping or electroplating.
Generic:	Belonging to a particular family.

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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 used in epoxy coatings.
Grit Blasting:	Abrasive blasting using grit as the blasting media.
Grit:	An abrasive blasting media obtained from slag and various other materials.
Hardener:	An activator curing agent, catalyst, or cross-linking agent.
Hardness:	The degree to which a material will withstand pressure without deformation or scratching.
High Build:	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.
Hot Rolled Steel:	Steel that has been formed while still hot, generally characterized by the presence of bluish-black mill scale.
Hydrophobic:	A substance that does not absorb or exhibit an affinity for water.
I-Beam:	A structural member of rolled steel whose cross-section resembles the capital letter I.
Immersion:	An environment that is continuously submerged in a liquid, often water.
Impact Resistance:	The ability to resist deformation or cracking due to a forceful blow.
Incombustible (Building Material):	Any building material that contains no 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 continued burning after this time period are combustible.
Incompatlbllty:	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.
Inhibitive Pigment:	A pigment that assists in corrosion prevention.
Inorganic:	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.
Intercoat Adhesion:	The adhesion between successive coats of paint.

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Intercoat Contamination:	The presence of foreign matter such as dust or dirt between successive coats of paint.
Intumescent Coating:	A fire-retardant coating that when heated produces nonflammable. gases which are trapped by the film, 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 Oxlde:	An oxide of iron. The naturally occurring state of steel.
Isopropyl Alcohol **(IPA):**	A volatile, flammable liquid used as a solvent; commonly known as rubbing alcohol.
Joint:	The space between the adjacent surfaces of two members or components joined and held together by nails, glue, cement, mortar, or other means.
Joist:	One of a series of parallel beams, usually 2 inches (5 cm) thick, used to support floor and ceiling loads, and supported in turn by larger beams, girders, or bearing walls.
Lacquer:	A coating comprised of a synthetic film forming material which is dissolved in organic solvents and dries by solvent evaporation,
Lacquer Thinner:	A solvent blend of ethyl alcohol, ethyl acetate, and toluene.
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.
Lifting:	Softening and raising or wrinkling of a previous coat by the application of an additional coat; often caused by coatings containing strong solvents.
Lintel:	A horizontal structural member that supports the load over an opening such as a door or window.
Lintel (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.
Mastic:	A pasty material used as a cement (setting tile) or a protective coating (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.

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Micron:	A micrometer or one millionth of a meter.
Mil:	One one-thousandth of an inch; 0.001 inch. Commonly used to denote coating thickness.
Mildew:	A superficial growth of living organic matter produced by fungi in the presence of moisture; results in surface discoloration and decomposition.
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, which is 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 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.
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.
Nonferrous:	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 portion of the paint 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 color of the surface to which it is applied.
Orange Peel:	The dimpled appearance of a dried paint film resembling the peel of an orange.
Organic:	Any chemical compound containing carbon.
Organic Zinc:	A zinc-rich coating using an organic resin such as an epoxy.
Overspray:	Sprayed coating that is dry when it hits the surface resulting in dusty, granular adhering particles, reduced gloss, and presenting a poor appearance.

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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.
Passivate:	To make a surface such as steel inert or unreactive, usually by chemical means.
Peeling:	A paint or coating lifting from the surface due to poor adhesion.
Penn:	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 a liquid or gas to pass or penetrate.
pH:	A measure of acidity and alkalinity; pH 1-7 is acid and pH 7-14 is alkali.
Phenolic:	A synthetic resin used for heat or water resistance.
Phosphatizing:	A pretreatment of steel by a chemical solution containing metal phosphates and phosphoric acid to temporarily inhibit corrosion.
Pickling:	The treatment of steel to remove rust and mill scale by immersing 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.
Pinholing:	A film defect characterized by small, pore-like flaws in a coating that extend entirely through the film.
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 consist 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.

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Porosity:	The presence of numerous minute voids in a cured material.
pyrometer:	An instrument used to measure the temperature of a surface.
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.
Reflectance:	The ratio of the intensity of reflected light to that of incidental light.
Reglet:	A recess to receive and secure metal flashing.
Relative Humidity:	The ratio, expressed as a percent, of the quantity of water vapor actually present in the air to the greatest amount possible at a given temperature.
Relief or Relieve:	Projection of ornamentation.
Resin:	A group of organic materials, either natural or synthetic, which 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.
Rust:	The reaction product of steel, oxygen, and water.
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.
Saponlflcatlon:	The alkaline hydrolysis of fats that forms a soap; typical reaction between alkyds and galvanized metals resulting in peeling.
Satin Flnlsh:	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 which are sometimes sprayed or otherwise applied to masonry.)

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Sealer:	A coating used on absorbent surfaces prior to paint.
Settling:	The sinking of pigments, extenders, or other solid matter in standing paint, accumulating on the bottom of the can.
Shop Prlmer:	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:	A finish obtained 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.
Silicone Resins:	Resins based on silicone instead of carbon, generally used for their outstanding heat resistance and water repellency.
Skew:	Inclination in any direction.
Sklnnlng:	The formation of a solid membrane on the top of a liquid, caused by partial curing or drying of the coating during storage.
Slip Joint:	A connection that permits vertical or horizontal movement of the cladding with respect to the structural frame.
Sound Rusted Substrate:	A rusted substrate cleaned of all loose rust and other loose materials, but not cleaned to bare metal.
Span:	The distance between structural supports such as walls, columns, piers, beams, girders, and trusses.
Splay:	A beveled or slanted surface.
Stress Corrosion Cracking:	Spontaneous cracking produced by the combined action of corrosion and static stress.
Structural Tube 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 to obtain a smooth, uniform surface before applying the finish coat.
Synthetic:	Manufactured, as opposed to naturally occurring.
Tabor Abraser:	An instrument used to measure abrasion resistance.
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.

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Termite Shield:	A shield, usually of noncorroding metal, placed in or on a foundation wall or other mass of masonry or around pipes to prevent passage of termites.
Texture:	Any finish other than a smooth finish.
Thermocouple:	A temperature measuring device.
Thermoplastic:	Resins having the property of becoming soft when heat is applied but which regain hardness after cooling.
Throat:	The undercut of a projected molding to form a drip.
Tolerance:	Acceptable dimensional allowance, under or over ideal net sizes.
Tolls:	Tool used to lift panels and grids in access flooring.
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.
Undercut:	Cut or molded to present an overhanging part, as 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 to prevent condensation. 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. Consists 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.
Viscosity:	A measure of fluidity of a liquid.
Voids:	Holidays or holes in a coating or material.
Wail Plate Anchor:	A machine bolt anchor with a head at one end and threaded at the other and fitted with plate or punched washer to securely engage the brickwork or concrete and hold the wall plate or other member in place.
Wail Tie:	Strip of metal used for tying a facing veneer to the body of a wall.
Wash Primer:	A thin paint, usually a chromate, designed to promote adhesion or to be used as a barrier coat.

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Water Repellent:	Any of several types of clear liquids used to render masonry walls less absorptive. These treatments maintain a material's ability to breathe away moisture, distinguished from "sealers" which form impervious, non-breathing coatings.
Water Retentivity:	Flow and resistance to segregation affect workability, which are in turn affected by the properties of both the cementitious materials and the aggregate.
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.
Wetting:	The ability of a vehicle to flow onto the surface to achieve a good bond.
white Rust:	The oxide of zinc formed on galvanized metal.
Zinc Dust:	Finely divided zinc metal used as a pigment in protective coatings.
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

SEE FOLLOWING EXAMPLE

APPENDIX C

TECHNICAL ADVISORY **T0501-1**

DATE: 1 0/91
SYSTEM: Roofing (CSI 07000)
ASSEMBLY: Built-Up (CSI 07510)
SUBJECT: Rooftop 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 mav exist adjacent to a planned roof installation, or when rooftop liahtina is reauired. 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