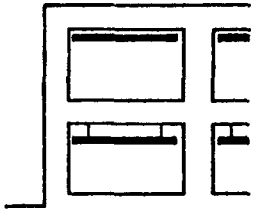
CEILINGS

INTRODUCTION



Two generic types of exposed ceiling were examined in this study. The first is a relatively thin surface which is attached or hung from the structure. The second type forms the roof or floor deck besides acting as the finished ceiling.

While the ceiling has little direct relationship to classroom activities, it must be durable, maintainable and safe. Performance related to lighting and acoustics is included in sections F and G of this report. The extent to which the appropriate requirements are met determines how well this sybsystem performs. In general, this subsystem is less affected by outside forces than any other and its technical performance is usually high.

The ceiling of the Parkside School is primarily structural wood decking which is painted white. Richard's School on the other hand uses a finished white hung fiber acoustical ceiling which is not structural. The Smith School uses a thick aluminum pan ceiling finished on its exposed side which is also structural. This recently has had acoustical tile applied to it in many areas of the school. Mount Healthy uses an exposed structural fiber panel ceiling which acts as roof deck. It is unpainted on its exposed surface. Each type as described above is treated separately in the discussion of findings. Ceiling types with limited applications such as in kitchen and gymnasium areas are not included in this report.

METHOD OF EXAMINATION

Visual observation was the primary method of examination in all schools. Where further investigation was warranted, testing was performed. Equipment used was relatively simple: a level, tape measure and ruler graduated to 1/64 inch. A tension scale was used to test the stability and adhesion of the ceiling. A camera was

used to record significant results. A more detailed description of testing procedures used can be found in the Field Tests Manual, 'Buildings In Use' Study. December, 1974.

SUMMARY OF PERFORMANCE	P	R	S	M
WOOD DECK				
Replacement/Repair	O	NA	NA	NA
Out of System Hardware	O	NA	NA	NA
All other considerations	O	NA	NA	NA
ACOUSTICAL TILE				
Deflection/Displacement	NA	⊙	⊙	NA
Cohesion/Adhesion	NA	O	⊙	NA
Indent/Scratch/Stain	NA	⊙	O	NA
Color/Flaking/Fading	NA	⊙	O	NA
Replacement/Repair	NA	●	●	NA
RIGID FIBER PANELS				
Deflection/Displacement	O	NA	NA	O
Cohesion/Adhesion/ Indent/Scratch/Stain	O	NA	NA	⊙

SUMMARY OF FINDINGS

Performance levels of the various ceiling materials studied were very satisfactory (85-95% level). This subsystem is usually not affected by outside forces and thus its performance is typically at a high level.

The Parkside School ceiling had the best performance of any school examined. A close examination of the subsystem showed virtually no problems.

Serious problems occur at the Richards School and are caused by the leaking roof. Performance required by this subsystem does not include resistance to such undue causes and thus the lack of cohesion and the staining of this subsystem does not therefore constitute detrimental performance. However, while the aluminum pan ceiling at the Smith School performs well (85%), acoustical problems (see section G) have necessitated attachment of fiber acoustical tile to this aluminum ceiling in many areas.

At the Mount Healthy School, a relatively new facility, the ceiling has satisfactory performance (95%), though in some places it has been saturated by roof leakage it has retained stability and cohesiveness.

DETAILS OF FINDINGS

WOOD DECK

WOOD DECK/PARALLEL TO FLOOR, DEFLECTION AND DISPLACEMENT, COHESION, ADHESION, INDENTATION, SCRATCH, STAIN, COLOR HOMOGENITY, FLAKING, PEELING, DUST ACCUMULATION, CLEANABILITY

Results: Performance was satisfactory in all of the above attributes of the Parkside School ceiling.
Probable cause: Not applicable
Discussion: Not applicable

WOOD DECK/REPLACEMENT, REPAIR

Results: Some minor staining and deterioration is present (85%).
Probable cause: Rare incidents of water penetration through the roof.
Discussion: Previous incidents of leakage have occurred which have caused some problems with the ceiling which have not been repaired or repaired incorrectly. We feel these are not continuing problems and that performance is acceptable.

WOOD DECK/OUT OF SYSTEM HARDWARE

Results: Performance is satisfactory. Electrical conduit is exposed on the classroom ceilings.
Probable cause: No available plenum space
Discussion: The electrical conduit used to supply ceiling luminaries is exposed, however, this does not cause a reduced level of performance.

ACOUSTICAL TILE

ACOUSTICAL TILE/PARALLEL TO FLOOR, DEFLECTION, DISPLACEMENT

Results: Performance is unsatisfactory (75%) in a few areas of the Richards School. Ceiling tiles have become displaced.
Probable cause: The suspension system used makes replacing tile difficult.

Discussion: A 'Z' spline type of suspension system was used which does not allow the easy replacement of one or a few tiles because tiles and splines interlock on all sides. The ad hoc solution used-cutting the 'tongue groove' edge of a tile off and fitting in one tile-will usually loosen in time because of the tenuous fit and visibily 'tilt' in the ceiling. This is not judged harmful but usually is quite evident.

ACOUSTICAL TILE/COHESION, ADHESION

Results: Performance level marginally acceptable (75%) at the Smith School (replacement tiles) and acceptable at the Richards School (85%).
Probable Cause: Replacement tile is being adhesively applied to the ceiling of the Smith School to solve acoustical problems. In some instances the tiles are falling because the painted surface of the aluminum pan to which they are adhered is delaminating from the metal.

ACOUSTICAL TILE/INDENTATION, SCRATCH, STAIN

Results: Performance is satisfactory. Staining occurs at the Richards School.
Probable cause: The staining of the ceiling tile is due to extensive leakage through the roof carrying dirt and rust.
Discussion: The water penetration through the roof membrane, which is described in more detail in the roof section of this report, has caused extensive damage to the ceiling. Attributes of this subsystem do not include resistance to such undue incidents and thus have been rated satisfactory. Tiles have been replaced (11-'74).

ACOUSTICAL TILE/COLOR HOMGENEITY, FLAKING, FADING

Results: Performance was satisfactory (85-95%) for these attributes.
Probable cause: Not applicable
Discussion: Not applicable

ACOUSTICAL TILE/REPLACEMENT, REPAIR

Results: Performance in the attribute of replacement is unsatisfactory (below 75%) at the Richards School.
Probable cause: The suspension system creates problems in replacing ceiling tile and the future performance of that tile.
Discussion: A "Z" spline ceiling system which uses 'z' shaped splines 12" on center to which the ceiling tiles are attached and the spline system is not visible is used. Due to the nature of this system it is extremely difficult to replace a single ceiling tile.

RIGID FIBER PANELS

RIGID FIBER PANELS/DEFLECTION, DISPLACEMENT

Results: Performance was satisfactory at the Mt. Healthy School.
Probable cause: Not applicable
Discussion: Not applicable

RIGID FIBER PANELS/COHESION, ADHESION, IDENTATION, SCRATCH, STAIN

Results: The performance at the Mount Healthy School was satisfactory. Cohesion performance of panels subject to water penetration through the roof membrane has been good.

Probable cause: Water penetration through the roof membrane has caused staining in some locations.
Discussion: The staining is only visible if the ceiling is inspected closely. The color of the panels (brown) and their textured pattern effectively camouflages existing staining.