

RTI Application 340/5/1875

The Sunday Mail

File B

***Infrastructure Services
Division***

TO: DIRECTOR, FACILITIES SERVICES BRANCH,
FROM: CHIEF FACILITIES OFFICER, STRATEGIC FACILITIES BRANCH,
SUBJECT: SAFETY GLASS/FILM TRIAL 2006/07

PURPOSE

1. To provide instruction to Facilities Services Branch on the last stage of the Safety/Glass Film trial in 2006/07.

BACKGROUND

2. A project plan was created in May 2006 which proposed a program of safety glass re-fits in 8 schools in 2005/06 at \$25,000 each (\$200,000) and again in 2006/07. The program actually delivered safety glass re-fits to 16 schools in 2005/06 at a total cost of \$400,000.
3. A major objective of the program was to use a combination of both safety glass and safety film in schools to determine effectiveness of both in terms of cost, durability and suitability.

ISSUES

4. No safety film has been applied to any high risk glass impact areas in any schools through the program to date. Therefore a major component of the program has not been carried out.
5. To evaluate the cost effectiveness of safety film versus safety glass, it is proposed that a trial featuring both film and glass be implemented in three schools in 2006/07. The following guidelines apply:
 - a) three schools will be chosen for the trial based on the work place health and safety injury data obtained in 2006. Suggested schools are Cunnamulla State School, Gordonvale State High School, and Tannum Sands State High School;
 - b) both safety glass and safety film will be used in each school in a 50/50 ratio by glass surface area;
 - c) the budget for each school will be \$25,000, a total budget of \$75,000;
 - d) to ensure best value for money it is preferable that suppliers be chosen who do not charge a project management fee;
 - e) as per the previous trial, an audit is to be carried out in each of the three schools to determine the priority for installation of film or glass in accordance AS 1288;
 - f) the audit and installation of film and glass in the three schools is to be completed by 30 June 2007.

- g) funds to be sourced from the Capital Works Program 2006-07 Rectification and Re-instatement sub-program.

CONSULTATION

6. The Manager Environmental Management Unit Facilities Services Branch, has advised that in order to ensure the trial is completed by 30 June 2007, the trial should commence before 31 March 2007.

OUTCOME

- 7. I request that you:
 - a) implement the Safety Film/Safety Glass 2006/07 trial at the earliest opportunity in accordance with paragraph 5 above; and
 - b) report to me by 31 August 2007 on the cost comparison between safety film and safety glass;
 - c) devise a process for reporting on the long term effectiveness (longevity and cost) of safety film and safety glass as a result of this trial and the trial conducted in 2005/06.

AL WAGNER
CHIEF FACILITIES OFFICER
STRATEGIC FACILITIES BRANCH

22 February 2007

THROUGH:

Comment: _____

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Project plan

Safety Glass Program

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Key Points Proposed

- \$200,000 to retrofit safety glass in 8 high risk schools in 2005-06;
- \$200,000 committed in 2006-07 Capital Works Program to deliver further retrofits;
- Cost to retrospectively comply with Australian Standards in the order of \$80 million;
- Results of assessments of 8 schools in 2005-06 program to inform estimate of overall cost;
- Direction to QBuild and school principals to follow Australian Standards for all glazing replacement works;
- Advisory assistance to schools to self assess glass safety risk;
- Building design guidelines to be updated and strengthened to incorporate Australian Standards in detail.

Introduction

DEA's Corporate Workplace Health and Safety Committee has identified an emerging trend regarding injuries to students and staff from impact with glass. Over the past two calendar years, more than 90 incidents have been recorded in schools.

EQ building standards and maintenance works regarding safety glass are carried out in accordance with the Building Code of Australia and relevant Australian Standards AS1288 Glass in Buildings and AS2208 Safety Glazing Materials in Buildings.

Changes to AS1288

AS1288 Glass in Buildings was updated in January 2006 and incorporates a number of enhanced risk management measures regarding safety glass. Some of the key changes include:

- Window located seating, work benches and even wide window sills can require safety glass up to 1000mm above the height of the additional element;
- All glazing within 5 metres of playgrounds, marked play courts could require safety glass up to 2 metres from ground level;
- Additional safety glass requirements around stairwells

Although the standard is not retrospective, recent common law cases have found the building owner liable for claims under duty of care obligations. This adds further weight to introduce a strategy to identify the overall departmental need and cost in terms of safety glass in all schools.

It is proposed to deliver an enhanced program of retrofits, maintenance works and design standards to minimise the risk of injury and provide a high level of duty of care to students and staff in schools.

A risk based approach is proposed, to target the highest risks under the following areas:

- School locations;
- Type of school (primary, secondary, P-12 etc);
- Subsets of school type – eg Band 10, 11
- Type of building in the school;
- Glass location with a high incidence of glass breakage and injury.

This program is similar to programs completed in schools in Victoria and New Zealand, where all schools were retrofitted with safety glass film at an average of 140 square metres of film per school.

Scope of the project

This project includes the strategy to reduce the risk of injuries from human impact with glass in schools. This includes the following elements:

- A proactive plan to retrofit risk areas within schools with safety glass;
- A reactive plan to address glass breakages in areas where safety glass is required;
- Design standards for safety glass in future construction, refurbishment and maintenance projects

Project objectives

The desired outcomes of this project are that:

- All existing safety glass requirements in State schools are met;
- Adequate management procedures are in place to cover safety glass provision in high risk locations in schools.

On this basis, it is expected that the number and severity of safety incidents related to human impact with glass will be reduced.

Description of Program

There are several elements required to deliver a comprehensive safety glass program. Each element or sub-category is set out below.

1. Retrofits

A proactive retrofit program is proposed to address the high risk safety glass requirements in accordance with AS1288.

Quantum

The total square metres of safety glass requiring retrofitting is in the order of 400,000 square metres, based on a ratio of 10 square metres of safety glass per 100 square metres of internal

floor space across the State. It is possible that the revised AS1288 would increase this estimate further.

This ratio was established by a Facilities Services Branch sample of school site assessments regarding safety glass requirements.

Cost

Retrofitting safety glass would be a combination of replaced glazing and the application of safety film, where AS1288 allows. Safety film costs approximately \$100 per square metre and replacement glazing \$300 per square metre. On the basis of a 1:1 ratio of these two types, a total cost of \$80 million is estimated to fully comply with AS1288.

To commence a retrofitting program, it is proposed to establish a risk based program of works to the value of \$200,000 in the 2005-06 and 2006-07 Capital Works Programs.

Priorities

It is proposed to commence retrofitting safety glass in schools on the basis of risk of injury. Departmental injury data for the past two calendar years is considered the best available method to establish the high risk locations.

The schools identified as the highest risk for injury due to impact with glass are as follows:

- Atherton State High School;
- Bowen State High School;
- Mitchelton State High School;
- Morayfield State High School;
- Morningside State School;
- North Rockhampton State High School;
- Sandgate District State High School;
- The Gap State High School

These schools have experienced 3 or more safety incidents over the past 2 years and are proposed to have \$25,000 retrofit projects completed in the 2005-06 Capital Works Program, under the Rectification and Reinstatement sub program.

The recommended scope of work for these projects is as follows:

- Audit/quote for all requirements to comply with AS1288 (as would occur if this was a new school)
- Identification of the highest risks for glass breakage from human impact as part of this audit/quote;
- Delivery of the highest risk work within the limit of available budget;
- Referral of the full audit/quote results to Strategic Facilities Branch to inform long term development of retrofit costs for all schools.

Future Funding Considerations

In addition to the \$400,000 of capital funding proposed over the next two years, other funding arrangements will be considered, including the following options;

- Additional capital funding, as required if departmental risk is assessed as higher than existing;
- Direction for schools to use Minor Works funding to address the highest risks as assessed by the departmental or school WH&S committee;
- An incentive based program to provide subsidy funding to schools funding retrofits; and
- A possible submission to Cabinet to fund a large scale retrofit program

2. Maintenance

In terms of replacing broken glass, QBuild operating policy is to replace all glazing up to 1000mm from the ground (internal or external) with safety glass. It is proposed that QBuild will be instructed in writing to comply with the full requirements of AS1288, which go beyond the existing operating policy.

Maintenance Special Program works, through the High Priority Building Asset Maintenance Program can include attention to glazing. The direction to QBuild will include coverage of these projects, if glazing work is part of the project scope.

It is also proposed that advisory information is developed by QBuild to assist school principals, Regional Facilities Managers and Account Managers to understand:

- the requirements of AS1288;
- methods to identify existing safety glass; and
- assistance for school Workplace Health & Safety Committees to assess local glass safety risks

In the event that schools self fund glass replacement works, Principals will be instructed in writing to comply with AS1288 in all instances. It is proposed that this will occur in two forms:

- Health & Safety Newsletter from Organisational Health Unit; and
- Letter to Principals from the AD/G School Resourcing and Administration

3. Design Guidelines

The existing departmental design guidelines direct new construction or refurbishments to work in accordance with Australian Standards in terms of glass and safety glass **installation**.

These guidelines will be strengthened to specify further detail regarding the application of the Standard.

It should be noted that this will potentially increase costs for new construction, refurbishments and prep year projects.

4. School Management Issues

It is proposed that schools are provided with advisory assistance to enable a local glass safety risk assessment and required action to occur. This risk assessment is **propos**ed to be possible through the school's WH&S committee and include:

- Guidance material regarding the application of AS1288
- Guidance regarding the identification of existing safety glass (either glazing or film)
- Guidance regarding risk assessment processes

It is proposed that QBuild are tasked with the development of this material, in liaison with Facilities Services Branch and Organisational Health Unit. The intention of the risk assessment is to be optional for schools to complete as part of regular WH&S management on the school site.

Stakeholders

Stakeholders (interested parties) in this project are:

- Members of the Corporate Workplace Health and Safety Standing Committee;
- Members of the Facilities Management Committee;
- Strategic Facilities Branch;
- Facilities Services Branch;
- Regional Executive Directors and Facilities Managers, Health and Safety Consultants;
- Schools;
- QCPCA;
- QTU; and
- Principals and Registrars Associations.

Project accountabilities

Roles and responsibilities for this project are:

Role	Responsibilities
Strategic Facilities Branch	<ul style="list-style-type: none"> • Develop departmental strategy and brief for individual retrofits • Prepare submissions and cost estimates for safety glass programs • Advocate for departmental or external funding to deliver strategies • Instruct Facilities Services Branch to deliver program via OLA
Facilities Services Branch	<ul style="list-style-type: none"> • Deliver and monitor the deliverables of this project • Co-ordinate delivery of approved projects according to brief provided • Provide liaison and feedback information with regions, external service providers and industry involved in program delivery • Task QBuild with maintenance tasks in this project • Develop communication plan to ensure that program deliverables and activities are clear and well understood
Organisational Health Unit	<ul style="list-style-type: none"> • Develop health and safety newsletters and draft AD/G School Resourcing and Administration correspondence related to safety glass

	<p>management in schools</p> <ul style="list-style-type: none"> • Liaise with Regional Health & Safety Consultants, Workplace Health and Safety Officers and health and safety committees regarding safety glass risk management, communication issues and advice
Office of School Resourcing and Administration	<ul style="list-style-type: none"> • Send letter to Principals regarding compliance with AS1288 for replacement of broken glass
Performance Measuring and Performance Branch	<ul style="list-style-type: none"> • Provide incident data and analysis of same to support risk assessment of schools for retrofitting program
Regional Facilities Manager/Account Manager	<ul style="list-style-type: none"> • Assist in delivery of retrofit projects as required • Provide advice to schools regarding departmental procedures, strategy and funding for safety glass program • Respond to school enquiries regarding safety glass requirements
Schools	<ul style="list-style-type: none"> • Ensure that AS1288 is complied with for all glass replacement works; • Incorporate risk assessment for glass breakage by human contact as part of regular school WH&S committee
QBuild	<ul style="list-style-type: none"> • Ensure that maintenance works are completed in accordance with revised AS1288 • Prepare advisory material to assist SFB, FSB, regions and schools with: <ul style="list-style-type: none"> • the requirements of AS1288; • methods to identify existing safety glass; and • assistance for school Workplace Health & Safety Committees to assess local glass safety risks • Advise FSB regarding risk issues as identified in delivering Asset Maintenance Program

Resources

The **costs** of this project are \$200,000 in the Capital Works Programs in 2005-06 and 2006-07 - being met from the Rectification and Reinstatement sub-program.

FSB program delivery costs and additional cost to schools through enhanced maintenance delivery are to be established.

Project schedule

The project schedule is as follows:

Activity	Time
Commence Project	3 April 2006
Create 2005-06 projects and commence work in schools	10 April 2006

Version 2 17 May 2006

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Safety Glass Project Plan

Completion of detailed communication plan	31 May 2006
School instruction via OHU newsletter and AD/G Schools Resourcing and Administration letter	31 May 2006
FSB instruction re compliance with AS1288 and request for advisory material	30 April 2006
Update of DEA design guidelines	31 May 2006
Development of 2006-07 priority projects	30 June 2006
Completion of 2005-06 retrofit projects	30 June 2006

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Risks

Risk	Risk Level	Treatment
2005-06 projects not completed	Medium	Early approval and referral through to Facilities Services Branch. FSB consultation with relevant EQ Regional Facilities Manager
Non compliance with AS1288 due to lack of understanding or commitment from schools and QBuild	Medium	Preparation and release of communication plan, letters to schools and QBuild re compliance requirements. QBuild project checking procedures required on a sample basis
Existing high risk glass locations not changed to safety glass	High	Schools encouraged to assess risks through local WH&S committee Advisory material provided to schools to raise awareness and understanding and enable local risk assessment Dept WH&S committee updated on progress of issue and quantum of need
Insufficient Funding to Address all Requirements	Medium	AS1288 is not retrospective, however building owners can be legally liable under duty of care Funding requirements to cover retrospective upgrades will be established through the course of the project

The ongoing risk of students or staff injuring themselves due to impact with glass remains, however will be reduced through the implementation of this program.

Project communication

Facilities Services Branch are proposed to deliver this program and develop and co-ordinate supporting communication measures, involving all key stakeholders.

Communication activities about this project will include:

- A project communication plan developed for key stakeholders;
- Ongoing liaison between Facilities Services Branch, Organisational Health Unit, Regions and Strategic Facilities Branch – update meetings as required to discuss program progress and resolve issues
- Develop health and safety newsletters and draft AD/G School Resourcing and Administration correspondence related to safety glass management in schools
- Regular updates from Facilities Services Branch to the departmental WH&S Committee;
- Preparation of advisory material to assist schools understand

- the requirements of AS1288;
- methods to identify existing safety glass; and
- assistance for school Workplace Health & Safety Committees to assess local glass safety risks

Project reporting will consist of:

- An interim project progress report for the Facilities Management Committee; and
- A final project report and review of outcomes for the Facilities Management Committee

Project Deliverables

This project will provide the following deliverables:

- Completion of retrofit projects as approved under the 2005-06 and 2006-07 Capital Works Program;
- Procedural instructions regarding school and QBuild compliance with Australian Standards
- An analysis of departmental requirements to fully comply with AS1288
- Updated design guidelines to reflect intent of current Australian Standards.

The success of the project will be evaluated by:

- A decrease in the number of glass safety incidents in schools;
- Compliance with AS1288 for all new works;
- Completion of committed retrofit projects on time and on budget;

Summary and recommendations - Safety Glass Retrofit Program in Schools

Executive Summary

Departmental injury data show that some student and staff injuries are caused by human impact on glass. The updated Australian Standard, AS 1288-2006 Glass in buildings – Selection and installation, provides a rigorous glass specification to safeguard against injury from this source. This report summarises the results of a pilot program of safety glass audits and refits in 16 Queensland State Schools, and safety glass/safety film audits and refits in an additional three schools. It also makes an assessment on the service delivery strategies used by the Regional Facility Managers (RFMs) and Facility Account Managers (FAMs) who were responsible for delivering the program in the chosen schools.

The nineteen schools were chosen from 7 DETA Regions to participate in the program. Inclusion in the program was based on the incidence of injury due to human impact on glass in Queensland State Schools obtained from Departmental injury data. Eight schools returned comprehensive audit reports while seven other schools returned audit reports with limited scope. The latter usually concentrated on high priority glass or glass in doors and were incomplete with respect to medium or low priority glass. Two schools returned audit reports that lacked basic data with respect to the area (or number of panes) and class (high, medium or low priority) of glass audited. These two schools were not included in the analysis.

The retrofit requirements for each school are based on the glass audit. The most comprehensive audits in order of usefulness are:

- Morayfield State High School (Sunshine Coast) - O'Brien Glass: "Glassassurance";
- Nambour State School (Sunshine Coast);
- Bundaberg State High School – (Wide Bay-Burnett) - James Glass;
- North Rockhampton State High School (Fitzroy-Central Queensland) - All Hours Glass and Aluminium;
- Mabel Park State School, Miami State High School, and Southport State High School (South Coast) - Browns Plains Glass;
- MacGregor State High School (Greater Brisbane) - Group H managed audit with quote provided by Brisbane Glass – other audits undertaken by Group H were not as comprehensive.

The following proportions are based on the eight comprehensive audits listed above:

- The proportion of high, medium and low priority glass across the eight schools is: 58% High : 33% Medium : 9% Low;
- The total glass area of a school is, on average (median), 3.2% (2.5%) of the gross floor area of a school;

Based on the 14 safety glass only retrofit schools (no schools where safety film installed):

- The average (median) cost of glass installation (glass + labour) per m² is: \$275 (\$293) / m². The range is \$162 to \$508 per m². (GST exclusive);
- The average (median) cost for a high priority glass refit is \$40,610 (\$24,095) per school (GST exclusive);
- The average (median) cost for a medium priority glass refit is \$24,282 (\$15,586) per school (GST exclusive).

Based on the three schools that returned a breakdown of glass and labour costs (GST exclusive):

- The average (median) cost of labour is \$72 (\$70) per hour. This is equivalent to the work involved in installing one pane of glass, so labour costs are often quoted on a per pane basis;
- Labour represents, on average (median), 37% (39%) of the installation cost of glass.

The cost of glass varies according to the type (toughened, laminated), its characteristics (thickness, clear or opaque, and pane size), and the vendor. (GST exclusive).

- Toughened glass:
 - More expensive - \$175 /m³ (5mm clear);
 - Needs to be cut to size at the factory (cf laminated glass),
 - Required for louvres.
- Laminated glass:
 - \$100 - \$154 / m³ (clear)
 - \$120 / m³ (grey)
 - Can be cut to size on site,
 - Suitable for most applications, except where one or more glass edges are exposed – therefore not suitable for louvres.

The cost of safety film varies according to the type (safety or security film), its characteristics (clear or tinted), and the vendor.

- Security film:
 - Same price as laminated glass (Browns Plains Glass and Screens);
 - Requires window to be removed, the film applied and the window then reinstalled
- Safety film:
 - About ½ cost of laminated glass (Browns Plains Glass and Screens);
 - \$50 / m²
 - Is applied directly to window

Advice was received from professional glaziers on the use of safety film to bring windows to compliance with AS1288:2006.

- An excellent product with a probable a lifespan of about 15 to 20 years with no significant environmental disadvantage in any **internal** application:
 - Lifespan is reduced on external applications where organic film is subject to weathering.
- Safety film has similar product cost to laminated safety glass:
 - Quite expensive for a single application to replace damaged or old product;
 - About ½ labour cost for installation compared to laminated safety glass.
- As an exposed polyester plastic, it can suffer damage more easily:
 - Third party scratching from cleaning or vandalism;
 - Windows with safety film can be smashed in more easily than laminated.

Area (m²) and cost per m² of work undertaken for safety glass refit within each participating region (Most cost-effective strategy and Least cost-effective strategy)

Region	Project management strategy	Glazier	N° Schools per glazier	Actual* or mean** (& median***) m ² glass fitted	Actual* or mean** (median***) cost per m ² of glass fitted		Was RFM/RAM satisfied with project management strategy (Yes/No)
					Glass and labour only	Glass + labour + all fees (program management fees, audit fees and/or adjustments)	
Far North Queensland	Regional officer managed project	F&E Glass and Aluminium Windows	1	Not available	Not available	Not available	Yes
Fitzroy-Central West Queensland	School managed project with regional officer oversight	Simmons Glass All Hours Glass and Aluminium	1	75 (75)	321 (321)	333 (333)	No
Greater Brisbane	Group H Program Management	Brisbane Glass O'Brien Glass	4 2	52 (51)	418 (427)	533 (544)	Yes
Mackay-Whitsunday	School managed project with regional officer oversight	Twin City Glass and Aluminium	1	Not available	Not available	Not available	No
South Coast	School managed project with regional officer oversight	Browns Plains Glass and Screens	4	135 (145)	202 (171)	202 (171)	Yes
Sunshine Coast	Regional officer managed project	O'Brien Glass	1	76	329	329	Yes
Wide Bay - Burnett	Regional officer managed project	G. James Glass and Aluminium	1	107	221	234	Yes

*Actual: The actual value recorded for a school is provided if only one school was refitted with safety glass in a given Region. If two or more schools were involved in the program within a Region then the mean and median were calculated for that school group.

**Mean: The average of a group of values. This figure gives a reasonable measure for a group of values, provided there are no extreme values. Extreme values may cause the mean to be weighted in one or other direction and therefore be an inaccurate representative value for the group.

***Median: If there are extreme values within a group then the median may provide a better representative value for the group. The median is determined by arranging the individual values from lowest to highest and picking the middle value. If there are an even number of values within a group then the median is the determined by adding the two middle values together and dividing this number by 2. If the mean and median are the same or very similar then it is unlikely that there are extreme values within that group.

Introduction

This document reports on the results of a trial Safety Glass Program undertaken in 16 Queensland schools in May and June, 2006. The program of audits and safety glass retrofits was undertaken to assess service delivery strategies and the level of implementation required to substitute, in Queensland schools, annealed glass considered to be high risk under the updated Australian Standard, AS 1288 2006 Glass in Buildings – Selection and installation.

Safety glass replacement priorities were established on the basis of risk of injury, and Departmental injury data for the past two years was used to identify Schools with the highest risk for injury due to impact with glass.

Two groups of eight schools, and a smaller group of 3 schools (Table 1) were recruited into this pilot program. The first group of schools (Group A) was recruited when the project was created on 4th April, 2006. Additional funding was provided and a second group of schools (Group B) was brought into the program on 1st June, 2006. The 2005-06 retrofit projects were completed by 30th June 2006.

The last group of three schools (Group C) were recruited to enable a direct comparison between safety glass retrofits and the application of safety film in Queensland schools. The work in these schools was undertaken during 2006-07, and was completed by 30 June, 2007.

Region	Group A	Group B	Group C
Darling Downs-South West Queensland			Cunnamulla SS
Far North Queensland	Atherton SHS		Gordonvale SHS
Fitzroy-Central West Queensland	North Rockhampton SHS*	Gladstone SHS	
Greater Brisbane	Mitchelton SHS Morningside SHS Sandgate District SHS The Gap SHS	MacGregor SHS* Wynnum North SHS	
Mackay-Whitsunday	Bowen SHS		
South Coast		Beenleigh SHS Mabel Park SS* Miami SHS* Southport SHS*	
Sunshine Coast	Morayfield SHS*		Nambour SS
Wide Bay - Burnett		Bundaberg SHS*	

* Schools in which COMPLETE glass audits were undertaken

Table 1. Nineteen Queensland State Schools that took part in the Safety Glass/Safety Film Retrofit Program. Group A comprises the first group of schools recruited into the program (4th April 06) while Group B comprises the second group (1st June 06). Group C schools were recruited in 2007 to compare safety film and safety glass retrofits.

Methodology and Limitations

Regional facility managers/account managers were given the responsibility to assist in the delivery of the audits and retrofit projects. The method of service delivery was left to their discretion to best provide for their individual and regional circumstances regarding timeframes and availability of service providers. A range of project delivery options are therefore evaluated in this report (Table 2). Programs for individual schools were supported to a limit of \$25,000.

Regional personnel returned audit reports and reports on the actual retrofits undertaken at each school. Evaluation of the service delivery methods employed was based on analysis of this data as well as on responses to a project questionnaire completed by the regional facility and account managers (for Groups A and B schools only).

Representatives of some of the service providers (Group H, O'Brien Glass, Browns Plains Glass and Brisbane Glass) were also informally interviewed (by phone or email). This was undertaken to gain an industry perspective on the interpretation of AS 1288-2006 and practical aspects in its application.

Region	Project management strategy	Glazier	N° Schools per glazier
Darling Downs-South West Queensland	Regional officer		1
Far North Queensland	Regional Officer	P&E Glass and Aluminium Windows	2
Fitzroy-Central West Queensland	School with regional officer oversight	Simmons Glass	1
		All Hours Glass and Aluminium	1
Greater Brisbane	Group H Program Management	Brisbane Glass	4
		O'Brien Glass	2
Mackay-Whitsunday	School with regional officer oversight	Twin City Glass and Aluminium	1
South Coast	School with regional officer oversight	Browns Plains Glass and Screens	4
Sunshine Coast	Regional officer	O'Brien Glass	2
Wide Bay - Burnett	Regional officer	G. James Glass and Aluminium	1

Table 2: Method of project management strategy and service providers by Region.

The study is limited by the variable quality of audit/quote data returned to EMU. This was associated with one or more of the following factors:

- The relatively short timelines imposed on groups B and C, due to approaching end-of-financial-year dead-lines, impacted on deliverables within the scope of work;
- Some contractors are small operators and possibly lack the resources to provide comprehensive audit reports within the required timeframe;
- The aftermath of Cyclone Larry has reduced the ability both contractors and Regional Facilities staff to fully deliver on the reports for some schools.

Some analyses are therefore restricted to data from schools for which a full safety glass audit is available.

Fourteen reports provided sufficient information for a determination of installation costs per m² for high, medium and low priority glass. Six reports (Table 1) provided complete glass audits and gave the most realistic picture of the distribution and extent of high priority glass within schools.

The installation cost usually comprised two quantities, the cost of glass and the labour cost. Generally glaziers will quote a single, per m² price (labour + product) for programmed upgrades involving multiple panels. Consequently most glaziers did not provide separate costs for labour and glass in their audit reports. Such a breakdown was provided in three reports, Mabel Park SS (Browns Plains Glass and Screens), Gladstone SHS (Simmons Glass) and North Rockhampton SHS (All Hours Glass and Aluminium).

Finally, the accuracy of quotes in relation to the work done was questionable in some cases. It appeared that charges were adjusted by some suppliers (up or down) to ensure that the work done came in at \$25,000. The miscellaneous costs and adjustments column (Appendix 1) records the difference between the quote and the final account paid. In the case of O'Brien Glass (Morayfield SHS) it records the re-imbusement of the audit when the company was awarded the refit contract.

A number of glaziers were interviewed to gain a better understanding of industry processes and views. The results of these interviews are summarised in Appendix 2.

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Assessment of work undertaken

Appendix 1 tables summarise the audit information returned from the participating schools. The pertinent details are presented in the following tables.

Fourteen reports from Group A and B schools provided sufficient information for an estimate of high, medium and low priority glass (as defined in AS 1288 2006) in schools. A subset of seven schools (Highlighted in Table 1) had comprehensive glass audits and these represent the most realistic distribution of high priority glass within schools. Fourteen reports contained sufficient information on the areas and risk priority of glass replaced in the actual retrofits.

The total areas (m²) and associated installation costs for each of the high, medium and low priority work across the participating schools are presented in Table 3. This information was used to determine the average cost per m² glass replaced (Glass + Labour only, GST exclusive). Not all schools were completely audited with respect to their safety glass requirements. A summary for a subgroup of seven schools with comprehensive safety glass audits is also presented in this table.

		Audited area and assessed risk priority (m ²)				Installation cost for safety glass (\$, Glass + Labour only, GST exclusive)				Mean and (Median) cost per m ² glass
		High priority	Medium priority	Low priority	Total	High priority	Medium priority	Low priority	Total cost for all glass	
Refitted glass (14 schools*)	Total	1,121	72	2	1,196	\$303,849	\$19,735	\$514	\$324,098	\$322
	%	94	6	0	100	94	6	0	100	(\$317)
All audited glass (14 schools*)	Total	2,314	1,051	91	3,455	\$568,533	\$191,233	\$28,559	\$784,975	\$275
	%	67	30	3	100	72	24	4	100	(\$293)
Audited glass - comprehensive audits only (seven schools**)	Total	1,759	980	90	2,829	\$386,114	\$169,977	\$25,209	\$581,300	\$239
	%	62	35	3	100	66	29	4	100	(\$181)

- *Fourteen schools only. Atherton SHS and Bowen SHS were not included in the analysis due to lack of adequate data on the distribution of high, medium and low priority glass in these schools.
- **The seven schools in which comprehensive audits were undertaken are MacGregor SHS, Nth Rockhampton SHS, Mabel Park SS, Miami SHS, Southport SHS, Morayfield SHS & Bundaberg SHS.

Table 3. The total area (m²) and installation costs to refit glass to AS1288: 2006. The table summarises the information obtained from audits undertaken at 14 schools, from a subgroup of 7 schools with comprehensive audits, and finally for the actual work undertaken. The glass is classified according to AS 1288: 2006 as having a high, medium or low risk priority, depending upon its position and surface area.

Sixty-seven percent of the audited glass (surface area) across the 14 schools was classified as high risk. This percentage was slightly less at 62% in the six schools that returned comprehensive glass audits. These high percentages result from the general requirements of AS1288: 2006 in combination with additional requirements, under the Standard, for schools. These requirements capture a significant proportion of the glass in schools and are summarised here:

Where any glazing is within 2000 mm above the ground level of all buildings it is considered likely to be subjected to human impact and, hence, shall comply with the human impact safety requirements of this Section.

1. In some circumstances the requirements of other Sections of this Standard can exceed the requirements of this Section.

2. Accident statistics show that glazing in some locations in buildings is more vulnerable to human impact than in others. These critical locations, some of which are shown in Figure 5.1, include the following:

- (a) In and around doors (particularly in side panels which may be mistaken for doors).
- (b) Panels mistaken for a doorway or opening.
- (c) Panels at low levels in walls and partitions.
- (d) Bathrooms, spa rooms and ensuites.
- (e) Buildings associated with special activities, e.g., gymnasias, enclosed swimming pools, etc,
- (f) **Schools and child care facilities.**

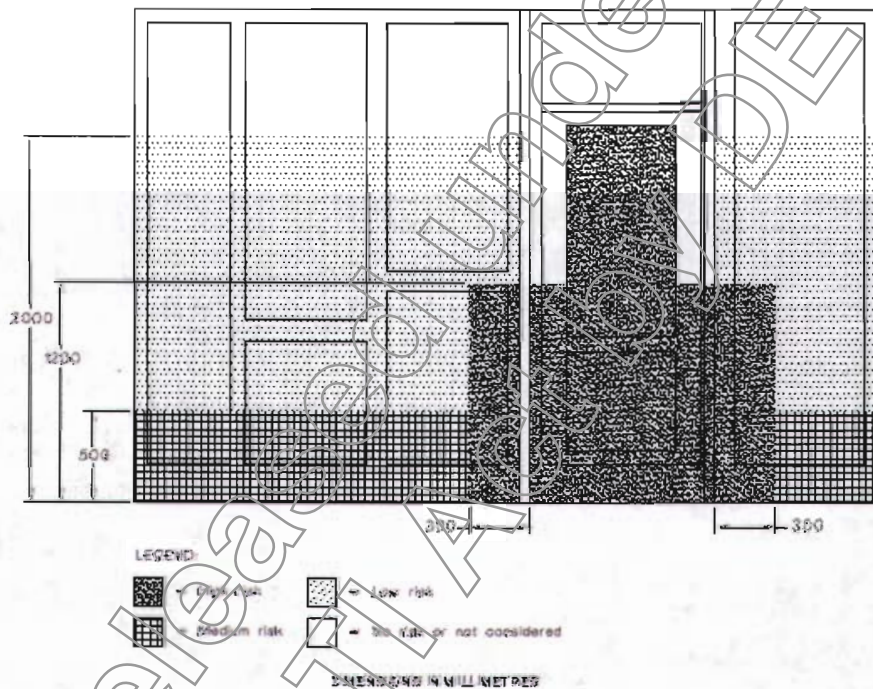


FIGURE 5.1 CRITICAL LOCATIONS

Schools and early childhood centres

Glazing within 1000 mm of the floor level or ground level shall be Grade A safety glass in accordance with—

- (a) Table 5.1 for fully framed glazing; or
- (b) Table 5.3 for unframed glazing.

NOTE: Schools refers to primary and secondary education facilities.

In all those parts of buildings where the planned activity can generate a high risk of breakage from human impact, such as in or about gymnasiums, swimming pools and spa pools and enclosures, **parts of schools**, halls, public viewing galleries, stadiums and the like, Grade A safety glazing material in accordance with Table 5.1 or 5.3 shall be used.

NOTE: Parts of schools referred to in the requirements of this Clause include glazing situated within 5000 mm of areas where activities such as those in relation to playgrounds, courts or marked out playing fields occur, unless otherwise protected by a permanent barrier.

Safety glass refit work was undertaken in the participating schools and concentrated almost exclusively (90%) on glass classified as high priority. The median cost of the refitted glass (per m²) was greater than that estimated from the initial audit and may reflect the higher standard of glass, and therefore cost, required for high priority risk areas compared to medium and low risk areas (Table 3).

Analysis of the costs associated with the work was attempted. A number of suppliers were contacted to determine the breakdown of the safety glass installation costs. Tables 4 and 5 summarise this information.

School	North Rockhampton SHS	Mabel Park SS	Gladstone SHS
Glazier	All Hours Glass and Aluminium	Browns Plains Glass and Screens	Simmons Glass
Cost of labour (\$ per pane = \$ per hour)	70	45	100
Cost of glass - toughened (5mm)	175	N/A	N/A
Cost of glass - grey laminate(5.38/6.38mm)	N/A	120	N/A
Cost of glass - clear laminate(5.38/6.38mm)	N/A	100	N/A

Table 4. Approximate costs of glass and labour (GST exclusive). The unit cost of glass (per m²) can vary within a quote and may depend on size/number of panes for reglaze.

School	Nth Rockhampton*	Mabel Park SS**	Gladstone SHS***
Glazier	All Hours Glass	Browns Plains	Simmons Glass and Aluminium
m2 glass replaced	975	160	84
Total cost of labour	93,030	8,505	9,400
Total cost of glass	145,109	19,069	12,892
Total cost (labour + glass)	238,139	27,574	22,292
Labour as a percentage of total cost	39	31	42
Glass as a percentage of total cost	61	69	58
Cost per m2 (labour + glass)	244	173	265

*Glass installed at Nth Rockhampton was toughened glass (\$175/m²)

**Glass installed at Mabel Park was various types of laminated glass (\$100-\$120/m²)

***Glass installed at Gladstone SHS was various types of laminated glass (\$154/m²)

Table 5. Break-down of glass and labour costs (Excl GST) for reglazing to total compliance for three schools for which relevant data is available.

Interviews of three glaziers revealed that labour is charged on a per hour basis. The replacement of a pane of glass, including preparation, cleaning and disposal activities is scheduled by these companies to take, on average, one hour. Louvres take less time and are charged accordingly. Hourly rates do vary significantly between the three companies, from \$45 to \$100 per hour (Table 4). A review of the audit data shows that labour costs represents 30% – 40% of the installation costs (Table 5).

The cost of Grade A safety glass is dependant upon type and specification. Toughened glass is more expensive than laminated glass, and opaque laminated glass is more expensive than clear laminated glass (Table 4). One glazier stated that clear laminated glass has not significantly risen in price over the past two decades and that it represents a cost effective quality product with a life span comparable to that of the building in which it is installed.

The cost of tinted or opaque laminated glass may be up to twice that of clear laminated glass. Its use in situations where privacy is an issue, such as teacher staff rooms or offices, can be obviated in many cases by installing curtains.

The use of toughened glass is mandated for louvres in AS 1288: 2006, but is otherwise not recommended for use in schools on the basis of:

- cost,
- it must be pre-cut at the factory and cannot be cut to size on site, and
- it does not provide the same level of security as laminated glass as the entire pane is more likely to break and give way on impact.

The use of organic safety films was not considered by any of the glaziers engaged in the first two rounds of this program. Glaziers who were interviewed did agree that it can be used, under the correct circumstances. AS 1288: 2006 allows the use of organic safety film on annealed glass to bring it into compliance regarding human impact PROVIDED that the glass is already of the correct thickness for its location and surface area (see Table 5.1 of AS 1288: 2006). The cost of film is less than that of laminated glass and labour costs are about one half of that for glass replacement. However the interviewed glaziers also stated that it does have a number of disadvantages:

- film can be scratched (unintentionally or through vandalism),
- glass treated with organic safety film is more easily broken than laminated glass because:
 - the film is 100µm thick compared to 400µm for laminated glass
 - the film is applied to the site size of the pane, not the entire pane
- film placed over old and deteriorated or poor quality annealed glass looks unattractive, and
- it has a more limited life-span of 15 to 20 years, which is further reduced when used for external applications subject to weathering.

Three schools were recruited into this final study. Table 6 summarises the information for the coverage and the costs involved. One school, Gordonvale SHS, had two audits completed. A comparison of the audits by Cairns Glass and O'Brien Glass is presented in Appendix 2, Table A7.

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School	Area of glass audited (m ²)	High Priority Glass				Medium Priority Glass				Low Priority Glass				Summary Safety Glass installation			Summary Safety Film Installation		
		Area (m ²) Safety Glass	Cost Safety Glass	Area (m ²) Safety Film	Cost Safety Film	Area (m ²) Safety Glass	Cost Safety Glass	Area (m ²) Safety Film	Cost Safety Film	Area (m ²) Safety Glass	Cost Safety Glass	Area (m ²) Safety Film	Cost Safety Film	Total Cost (glass + labour)	Cost per m ² glass	Cost per m ² floor area	Total Cost (film + labour)	Cost per m ² glass	Cost per m ² floor area
Cunnamulla SHS	113	33	8,290	12	1,032	14	3,382	11	897	7	1,696	26	2,216	13,368	248	3.9	4,145	85	1.2
Gordonvale SHS (O'Brien Audit)	86	33	9,808	20	2,077	0	0	16	1,658	15	4,432	0	0	14,241	297	1.8	3,735	104	0.5
Nambour SS	318	58	17,849	23	2,430	0	0	56	4,850	0	0	0	0	17,849	308	2.4	7,280	92	1.0
Median =	113	33	9,808	20	2,077	0	0	16	1,658	7	1,696	0	0	14,241	297	2.4	4,145	92	1.0
Mean =	172	41	11,982	18	1,846	5	1,127	28	2,468	7	2,043	9	739	15,153	284	2.7	5,053	94	0.9

Table 6. Distribution of safety glass and safety film retrofits and the installation costs (GST exclusive) within three schools.

Responses from regional facility and account managers on service delivery

Regional facility and account managers involved in the program were asked to provide responses to a series of questions (Appendix 2) to assess their level of satisfaction with their chosen method of program management, and of the service delivery and quality of the audit reports provided by the glaziers. The questions and their responses are summarised in Figures 1 and 2.

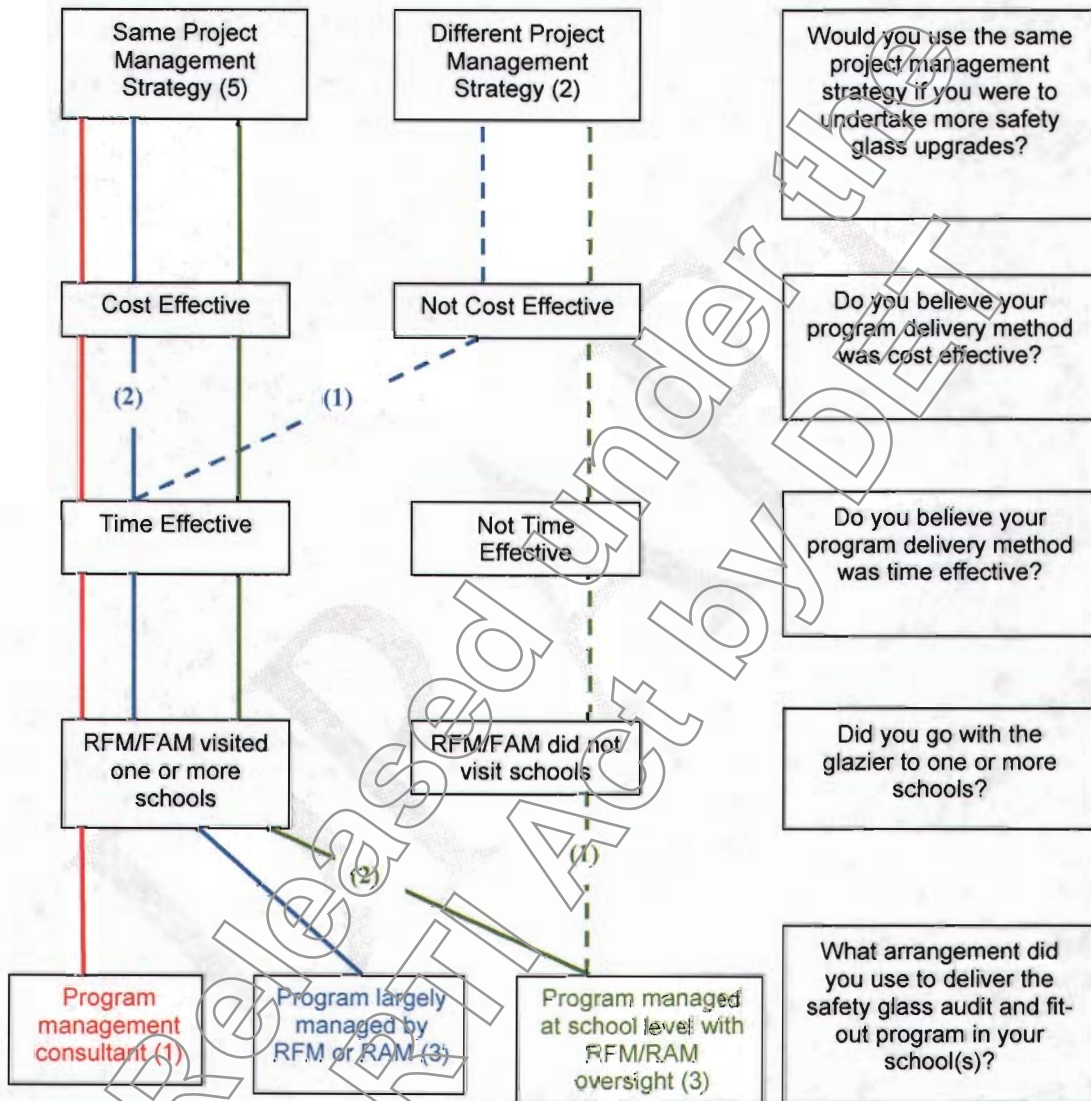


Figure 1. RFM/FAM responses regarding the program management strategy employed. The numbers in brackets represent the number RFM/FAMs who adopted a particular program management strategy or the split in numbers where responders differ when answering the next question.

Figure 1 summarises the responses by RFM/FAM's regarding their adopted project management strategies. There are three project management strategies (Table 1) based on the level of direct involvement by regional staff. The general consensus (5 from 7 responses) is that the project management strategies used were effective and would be adopted in similar programs should they become available. The level of satisfaction with one or more aspects of service delivery did vary.

Employing a professional program manager (Group H) to run the program over a number of schools was considered successful. Direct program management by Regional personnel was also generally well regarded. The lowest level of involvement also produced the lowest level of satisfaction. The latter reflects the impact on time and resources of managing the regional response as well as the availability of local glaziers following Cyclone Larry.

The level of satisfaction with the extent of the audit and the quality of the report varied between RFM/FAM's and influenced their ability to make informed decisions (Figure 2). Factors that contributed included the capacity of the glazier to undertake the audit and the level of direct involvement by the project manager (FAM or Group H) in the audit process.

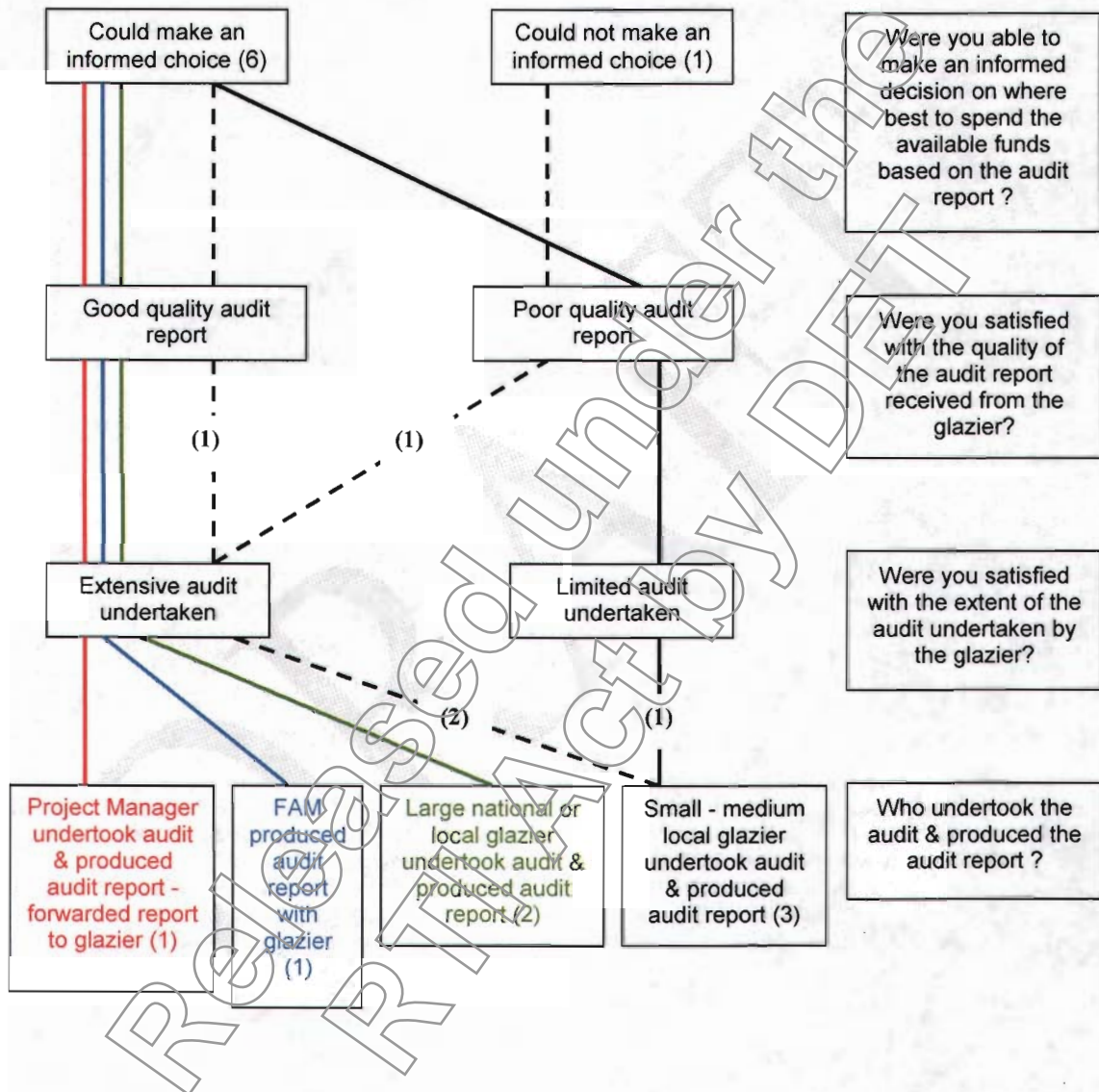


Figure 2: RFM's and FAM's used a variety of strategies to audit glass in the participating schools to obtain an audit report. The numbers in brackets represent the number RFM/FAMs who undertook a given strategy for the audit and report or the split in numbers where responders differ when answering the next question.

Six of the seven regional personnel were able to make an informed decision based on the report. There was feedback that decisions did require discussion with the glazier. One regional manager reported an inability to make a decision independently and commented that the decision was based entirely on the glazier's recommendations.

Seven of the audits were comprehensive and provided data on the distribution of high, medium and low priority glass that covered the entire school. Seven other audits, including 5

of the 5 audits managed by Group H, appeared more restricted in scope. These latter audits reported mainly on high risk glass within a school, but it is uncertain whether these represent a complete audit of this class. Other classes of glass (medium and low priority glass) were not well represented in these reports. Two schools returned reports with little detail. Their reports comprised lists of work to be undertaken to replace high risk panes with safety glass, work that fell within the \$25,000 program limit. The type of glass used and the area of glass replaced were not provided.

Some companies charged for their audits. Two glaziers relinquished their audit charges when they were offered the contract to undertake the work. The project management company, Group H, charged \$3,350 for each school whose program it managed. They undertook the audits within each school and that cost is part of that program management fee. Appendix A also lists the audit and project management fees. The project management fees charged by Group H impacted substantially on the amount of glass refits that could be undertaken.

From EMU's perspective the best audits were obtained from large glaziers with significant resources commensurate with their size. Comprehensive, professional reports were provided by O'Brien Glass (Glassassurance Compliance Inspection of Morayfield SHS), Browns Plains Glass and Screens (Beenleigh SHS, Mabel Park SS, Miami SHS, and Southport SHS), and All Hours Glass and Aluminium (North Rockhampton SHS). The audit reports returned by Group H Project Managers were hand drawn, sometimes illegible, and sometimes confusing as to the glass audited and the glass refit work undertaken.

One small to medium size glazier, James Glass (Bundaberg SHS), was also associated with a comprehensive audit report. However on this occasion the report was prepared by Bill Brown personally (FAM, Wide Bay-Burnett) as he attended the audit and transcribed the data directly into a spreadsheet of his own design. The remaining small to medium firms provided audit reports that lacked the desired level of detail required for this report but which were generally considered adequate for making decisions on refit priorities and the costs involved. All regional personnel indicated satisfaction with the actual refits that were undertaken.

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Appendix 1: Summary of audit information for schools involved in the safety glass/safety film retrofit program.

School	School Gross Floor area (m ²)	Area of glass audited (m ²)	As % of School Floor area	Area of high risk glass (m ²)	As % of total area glass audited	Area of medium risk glass (m ²)	As % of total area glass audited	Area of low risk glass (m ²)	As % of total area glass audited
Morayfield SHS	12,957	153	1%	41	27%	69	45%	43	28%
Mabel Park SS	10,136	160	2%	115	72%	45	28%	0	0%
Southport SHS	12,331	286	2%	286	100%	0	0%	0	0%
Nambour SS	7,519	318	4%	81	25%	132	42%	105	33%
Bundaberg SHS	16,391	396	2%	260	66%	89	23%	47	12%
Miami SHS	11,413	402	4%	402	100%	0	0%	0	0%
MacGregor SHS	17,859	459	3%	47	10%	412	90%	0	0%
North Rockhampton SHS	11,949	975	8%	609	63%	365	37%	0	0%
Mean =	12,569	393	3.2%	230	58%	139	33%	24	9%
Median =	12,140	357	2.5%	187	64%	79	33%	0	0%

Table A1 Total areas and proportions of high, medium and low risk glass audited in 8 schools for which the information was available. High, medium and low risk glass are defined within AS 1288 – 2006.

Program Scope	District	School	Total Area of glass audited (m2)	Area and % of Glass Replaced or Safety Film applied		High Priority Glass		Medium Priority Glass		Low Priority Glass	
				Area (m2)	As % of glass audited	Area (m2)	As % of total area glass replaced	Area (m2)	As % of total area glass replaced	Area (m2)	As % of total area glass replaced
Safety Glass only "Includes Safety Film"	Fitzroy-Central West Queensland	Gladstone SHS	213	84	39%	84	100%	0	0%	0	0%
Safety Glass only	Fitzroy-Central West Queensland	North Rockhampton SHS	975	66	7%	66	100%	0	0%	0	0%
Safety Glass only	Greater Brisbane	MacGregor SHS	459	47	10%	47	100%	0	0%	0	0%
Safety Glass only	Greater Brisbane	Mitchelton SHS	55	38	70%	33	86%	5	14%	0	0%
Safety Glass only	Greater Brisbane	Morningside SS	63	57	91%	57	100%	0	0%	0	0%
Safety Glass only	Greater Brisbane	Sandgate District SHS	71	71	100%	70	98%	0	0%	1	1%
Safety Glass only	Greater Brisbane	The Gap SHS	88	55	63%	55	100%	0	0%	0	0%
Safety Glass only	Greater Brisbane	Wynnum North SHS	54	44	82%	44	100%	0	0%	0	0%
Safety Glass only	South Coast	Beenleigh SHS	83	83	100%	83	99%	0	0%	0	0%
Safety Glass only	South Coast	Mabel Park SS	160	147	92%	115	78%	32	22%	0	0%

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Safety Glass only	South Coast	Miami SHS	402	167	41%	167	100%	0	0%	0	0%
Safety Glass only	South Coast	Southport SHS	286	145	51%	145	100%	0	0%	0	0%
Safety Glass only	Sunshine Coast	Morayfield SHS	153	76	50%	41	54%	35	46%	0	0%
Safety Glass only	Wide Bay-Burnett	Bundaberg SHS	396	107	27%	105	98%	0	0%	1	1%
Includes Safety Film	Darling Downs-South West Queensland	Cunnamulla SS	113	113	100%	45	40%	24	21%	44	39%
Includes Safety Film	Far North Queensland	Gordonvale SHS (O'Brien Audit)	86	86	100%	53	62%	18	21%	15	17%
Includes Safety Film	Sunshine Coast	Nambour SS	318	137	43%	81	59%	56	41%	0	0%
		Median =	153	83	63%	66	99%	0	0%	0	0%
		Mean =	234	90	63%	76	87%	10	10%	4	3%

Table A2 Actual areas of glass retrofitted with safety glass or safety film in 17 schools.

District	School	Area of glass audited (m2)	High Priority Windows/Partitions		Medium Priority Windows/Partitions		Low Priority Windows/Partitions		Summary Safety Glass installation		
			Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Glass	Total Cost (glass + labour)	Cost per m2 glass	Cost per m2 floor area
Fitzroy-Central West Queensland	Gladstone SHS	213	213	60,667	0	0	0	0	285	60,667	4.4
Fitzroy-Central West Queensland	North Rockhampton SHS	975	609	150,005	365	88,134	0	0	244	238,139	19.9
Greater Brisbane	MacGregor SHS	459	47	27,910	412	37,096	0	0	142	65,006	3.6
Greater Brisbane	Mitchelton SHS	55	33	13,629	22	9,110	0	0	258	22,739	2.0
Greater Brisbane	Morningside SS	63	57	21,340	6	1,453	0	0	339	21,340	4.4
Greater Brisbane	Sandgate District SHS	71	70	20,570	0	0	1	526	297	21,096	1.3
Greater Brisbane	The Gap SHS	88	54	17,497	33	10,693	0	0	320	28,190	2.5
Greater Brisbane	Wynnum North SHS	54	44	20,845	10	2,086	0	0	425	22,930	2.3
South Coast	Beenleigh SHS	83	83	25,260	0	0	0	0	304	25,260	1.8

South Coast	Mabel Park SS	160	115	20,140	45	7,434	0	0	27,574	172	2.7
South Coast	Miami SHS	402	402	66,333	0	0	0	0	66,333	165	5.8
South Coast	Southport SHS	266	286	51,789	0	0	0	0	51,789	181	4.2
Sunshine Coast	Morayfield SHS	153	41	13,503	69	21,726	43	13,743	48,972	320	3.8
Wide Bay-Burnett	Bundaberg SHS	396	260	56,435	89	15,586	47	11,467	83,487	211	5.1
	Median =	156	77	23,300	16	4,760	0	0	38,581	272	3.7
	Mean =	247	165	40,423	75	13,808	6	1,838	55,966	262	4.6

Table A3 Projected costs for safety glass retrofits based on audits

School	Area of glass audited (m2)	High Priority Windows/Partitions				Medium Priority Windows/Partitions				Low Priority Windows/Partitions				Summary Safety Glass installation			Summary Safety Film Installation		
		Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Film	Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Film	Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Film	Total Cost (glass + labour)	Cost per m2 glass	Cost per m2 floor area	Total Cost (film + labour)	Cost per m2 glass	Cost per m2 floor area
Gunnamulla SS	113	33	8,290	12	1,032	14	3,382	11	897	7	1,696	26	2,216	13,368	248	3.9	4,145	85	1.2
Gordonsvale SHS (O'Brien Audit)	86	33	9,808	20	2,077	0	0	16	1,658	15	4,432	0	0	14,241	297	1.8	3,735	104	0.5
Nambour SS	313	58	17,687	23	2,430	72	18,738	56	4,850	32	10,278	73	6,920	48,134	288	6.4	14,200	93	1.9
Median =	113	33	9,808	20	2,077	14	3,382	16	1,658	15	4,432	26	2,216	14,241	288	3.9	4,145	93	1.2
Mean =	171	41	11,928	18	1,846	29	7,373	28	2,468	18	5,469	33	3,045	25,248	278	4.0	7,360	94	1.2

Table A4 Projected costs for safety film/safety glass retrofits based on audits.

District	School	Area of glass audited (m2)	High Priority Glass		Medium Priority Glass		Low Priority Glass		Summary Safety Glass installation		
			Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Glass	Area (m2)	Cost Safety Glass	Total Cost (glass + labour)	Cost per m2 glass	Cost per m2 floor area
Fitzroy-Central West Queensland	Gladstone SHS	213	84	22,292	0	0	0	0	22,292	265	1.6
Fitzroy-Central West Queensland	North Rockhampton SHS	975	66	25,000	0	0	0	0	25,000	379	2.1
Greater Brisbane	MacGregor SHS	459	47	21,650	0	0	0	0	21,650	460	1.2
Greater Brisbane	Mitchelton SHS	55	33	13,629	5	5,933	0	0	19,562	515	1.7
Greater Brisbane	Morningside SS	63	57	21,340	0	0	0	0	21,340	374	4.4
Greater Brisbane	Sandgate District SHS	71	70	21,096	0	0	0	1	21,096	297	1.3
Greater Brisbane	The Gap SHS	88	54	21,594	0	0	0	0	21,594	397	1.9
Greater Brisbane	Wynnum North SHS	54	44	20,848	0	0	0	0	20,848	386	2.1
South Coast	Beenleigh SHS	83	83	25,000	0	0	0	0	25,000	301	1.8
South Coast	Mabel Park SS	160	115	20,140	32	5,014	0	0	25,154	171	2.5
South Coast	Miami SHS	402	167	26,948	0	0	0	0	26,948	161	2.4

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South Coast	Southport SHS	286	145	24,739	0	0	0	0	0	24,739	171	2.0
Sunshine Coast	Morayfield SHS	153	41	13,503	35	11,497	0	0	0	25,000	329	1.9
Wide Bay-Burnett	Bundaberg SHS	107	105	25,000	0	0	1	0	0	25,000	234	1.5
	Median =	130	68	21,622	0	0	0	0	0	23,516	315	1.9
	Mean =	226	79	21,627	5	1,603	0	0	0	23,230	317	2.0

Table A5 Actual safety glass retrofit costs (material and labour costs only)

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School	Area of glass audited (m2)	High Priority Glass			Medium Priority Glass			Low Priority Glass			Summary Safety Glass installation			Summary Safety Film Installation					
		Area (m2) Safety Glass	Cost Safety Glass	Area (m2) Safety Film	Area (m2) Safety Glass	Cost Safety Glass	Area (m2) Safety Film	Area (m2) Safety Glass	Cost Safety Glass	Area (m2) Safety Film	Total Cost (glass + labour)	Cost per m2 glass	Cost per m2 floor area	Total Cost (film + labour)	Cost per m2 glass	Cost per m2 floor area			
Cunnamulla SHS	113	33	8,290	12	1,032	14	3,382	11	897	7	1,696	26	2,216	13,368	248	3.9	4,145	85	1.2
Gordonvale SHS (O'Brien Audit)	86	33	9,808	20	2,077	0	0	16	1,658	15	4,432	0	0	14,241	297	1.8	3,735	104	0.5
Nambour SS	318	58	17,849	23	2,430	0	0	56	4,850	0	0	0	0	17,849	308	2.4	7,280	92	1.0
Median =	113	33	9,808	20	2,077	0	0	16	1,658	7	1,696	0	0	14,241	297	2.4	4,145	92	1.0
Mean =	172	41	11,982	18	1,846	5	1,127	28	2,468	7	2,043	9	739	15,153	284	2.7	5,053	94	0.9

Table A6 Actual safety film/safety glass retrofit costs in the three schools (material and labour costs only).

Location	Safety Film				Safety Glass			
	O'Brien Area Film (m ²)	O'Brien Cost Film (\$)	Cairns Glass Area Film (m ²)	Cairns Glass Cost Film (\$)	O'Brien Area Safety Glass (m ²)	O'Brien Cost Safety Glass (\$)	Cairns Glass Area Safety Glass (m ²)	Cairns Glass Cost Safety Glass (\$)
Administration Block	8	970	0	0	1	275	8	1,711
Resource (Photocopy?)	7	693	2	240	0	0	0	0
Block A	4	373	9	1,071	16	4,547	35	10,576
Block B	6	602	0	0	11	3,382	21	4,093
Block C	6	586	3	360	7	2,128	8	1,565
Block D	0	0	0	0	4	1,283	2	555
Block E	1	57	0	0	5	1,497	1	492
Block F	0	0	0	0	2	205	2	493
Recreation (Play Area?)	2	1,128	2	240	4	1,129	0	0
Library	0	0	0	0	0	0	4	987

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Kitchen-Laundry	0	0	0	0	0	0	0	0	1	410
Staff	0	0	0	0	0	0	0	0	0	135
Totals	33	4,409	16	1,911	51	14,446	83	21,017		
Cost per square metre		134		119		285		252		
	O'Brien	Cairns Glass								
Total Area for both Film and Glass	83	99								
Total Cost for both Film and Glass	18,855	22,928								
Cost per squared metre for combined Film and Glass	226	231								

Table A7 Gordonvale SHS – comparison of audits by Cairns Glass and O'Brien Glass.

Appendix 2: Summary of industry responses to interview regarding safety glass refit program

An industry perspective on the scope and practical implications of implementing AS 1288 - 2006, and the use of safety film was obtained by interviewing representatives of Group H, O'Brien Glass, Browns Plains Glass and Brisbane Glass. A summary of the major points arising from those discussions is presented below.

<p>Scope of AS 1288 - 2006</p>	<ul style="list-style-type: none"> • Shifts the emphasis from a predominately a human impact requirement (as in previous Standard) to a joint <u>human impact requirement and ultimate state design load requirement</u> (impact or force, be it human or environmental). <ul style="list-style-type: none"> i) The most stringent relevant requirement is to be adopted; ii) To comply with the standard both of these requirements need to be met for a non-residential classification, such as a school. • The type of safety glass used at various heights above ground level is dictated by these two criteria in conjunction with the size (surface area) and position of glazed panels: <ul style="list-style-type: none"> i) The larger a glass panel is in surface area indicates that a thicker glass is to be used, but not necessarily always a safety glass; ii) If a glass panel is in a potential human impact position, then a safety glass may be required to a height of two metres, or possibly more. • The standard indicates that the structural effects of an organic safety film or other coating shall be ignored in the design of the glass: <ul style="list-style-type: none"> i) This means that if the glass isn't the correct thickness (for its surface area and position) then safety film can not be applied to annealed glass to make it a safety glazing material and comply with the standard: <ul style="list-style-type: none"> (1) Eg a 3mm thickness window panel over 0.85m² in area does not comply with basic strength requirement, so applying a safety film to the panel will also not comply; (2) In the case of the School (Morayfield SHS) most glazing was 6mm, so it probably would have complied with all requirements and safety film can be applied. • The various safety glasses all have maximum surface areas able to be used for a given thickness of glass, irrespective of position.
<p>Laminated Glass</p>	<ul style="list-style-type: none"> • Life time product • Laminated glass can be cut to size at site. • Laminated glass cannot be used where there is one or more exposed edges in the installation. • Clear laminated glass the preferred option for schools: <ul style="list-style-type: none"> i) Cost of clear laminated glass has not increased much over the past 20 years – very economical; ii) Tinted or opaque laminated glass is more expensive (up

	<p>to double cost of clear laminated);</p> <p>iii) Issues of privacy for teacher rooms, offices etc (opaque glass) could be met with the installation of curtains;</p> <p>iv) Issues of sun/UV protection could be satisfied with curtains, or solar film (which is much cheaper than security film).</p>
Toughened Glass	<ul style="list-style-type: none"> • Life time product • Toughened glass cannot be cut to size on site – must first measure up frame and then prepare toughened glass panel of appropriate size at factory. • Some panel positions are governed by minimum thickness requirements: <ul style="list-style-type: none"> i) Existing frames may only accommodate certain thickness glass: <ul style="list-style-type: none"> (1) Eg a sidelight window above one metre which has too large an area for annealed glazing but its frame is too thin to accommodate laminated safety glass glazing - so a toughened glass is required. • Any glass with exposed edges such as louvres must be a minimum thickness toughened safety glass: <ul style="list-style-type: none"> i) Louvres where A grade safety glass is required must be a minimum of 5mm toughened. • Toughened glass is NOT the preferred option for schools: <ul style="list-style-type: none"> i) Toughened glass panes normally shatter completely on impact of laminated glass in which the pane maintains its integrity when the glass is broken; ii) Security issue as a pane broken due to an act of vandalism can then allow egress into room, cf laminated panes broken due to impact generally remain whole; iii) Shattered toughened glass leaves a lot of glass to clean up after break rather than simply removing a broken but entire pane of laminated glass.
Organic Safety Film	<ul style="list-style-type: none"> • An excellent product with a probable a lifespan of about 15 to 20 years with no significant environmental disadvantage in any internal application: <ul style="list-style-type: none"> i) Lifespan is reduced on external applications where organic film is subject to weathering. • Safety film has similar product cost to laminated safety glass: <ul style="list-style-type: none"> i) Quite expensive for single a single application to replace damaged product; ii) Tinted product costs more. • About ½ labour cost for installation compared to laminated safety glass. • As an exposed polyester plastic, it can suffer damage more easily: <ul style="list-style-type: none"> i) Third party scratching from cleaning or vandalism; ii) Windows with safety film can be smashed in more easily than laminated glass as the film is only applied to the site size of the glass and is considerable thinner (100 microns

	<p>as against nearly 400 microns in laminated glass);</p> <p>iii) Because film on one side of glass only – possible to have shards of glass sticking outwards from side without film;</p> <p>iv) If damage to film occurs then it's a matter of removing & refitting another film - quite expensive on single application.</p> <ul style="list-style-type: none">• Film placed over old and deteriorated or poor quality annealed glass looks unattractive
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