Applying the Pearl Rating System

Envelope Thermal Performance Compliance

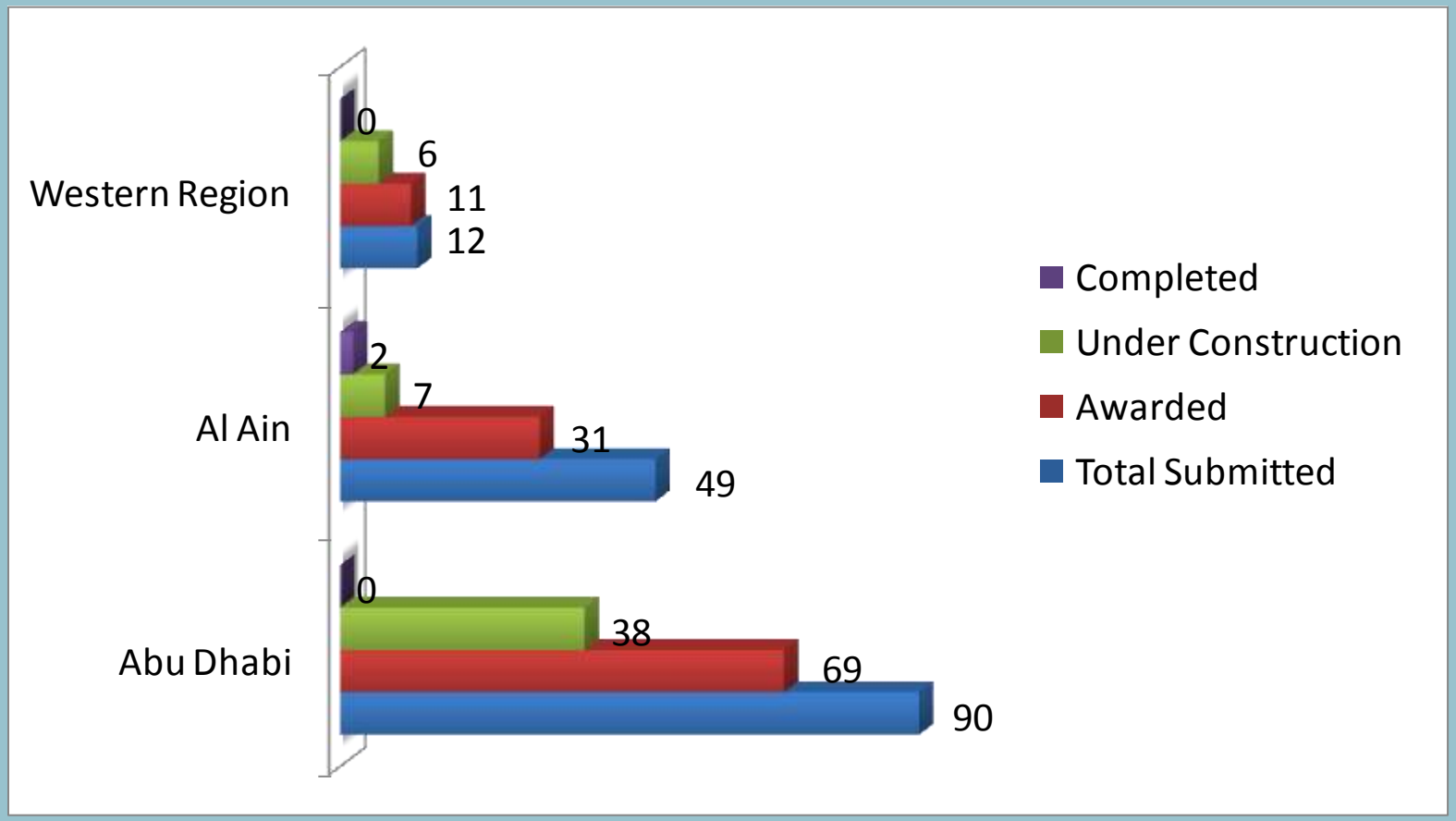
Outline

- Introduction
- Site Audit Stages and Process
- Case Study – Envelope Thermal Performance
- Final Remarks
- Questions

Introduction

Pearl Rating System Process

Estidama Projects on the Ground



Sustainable Legacy

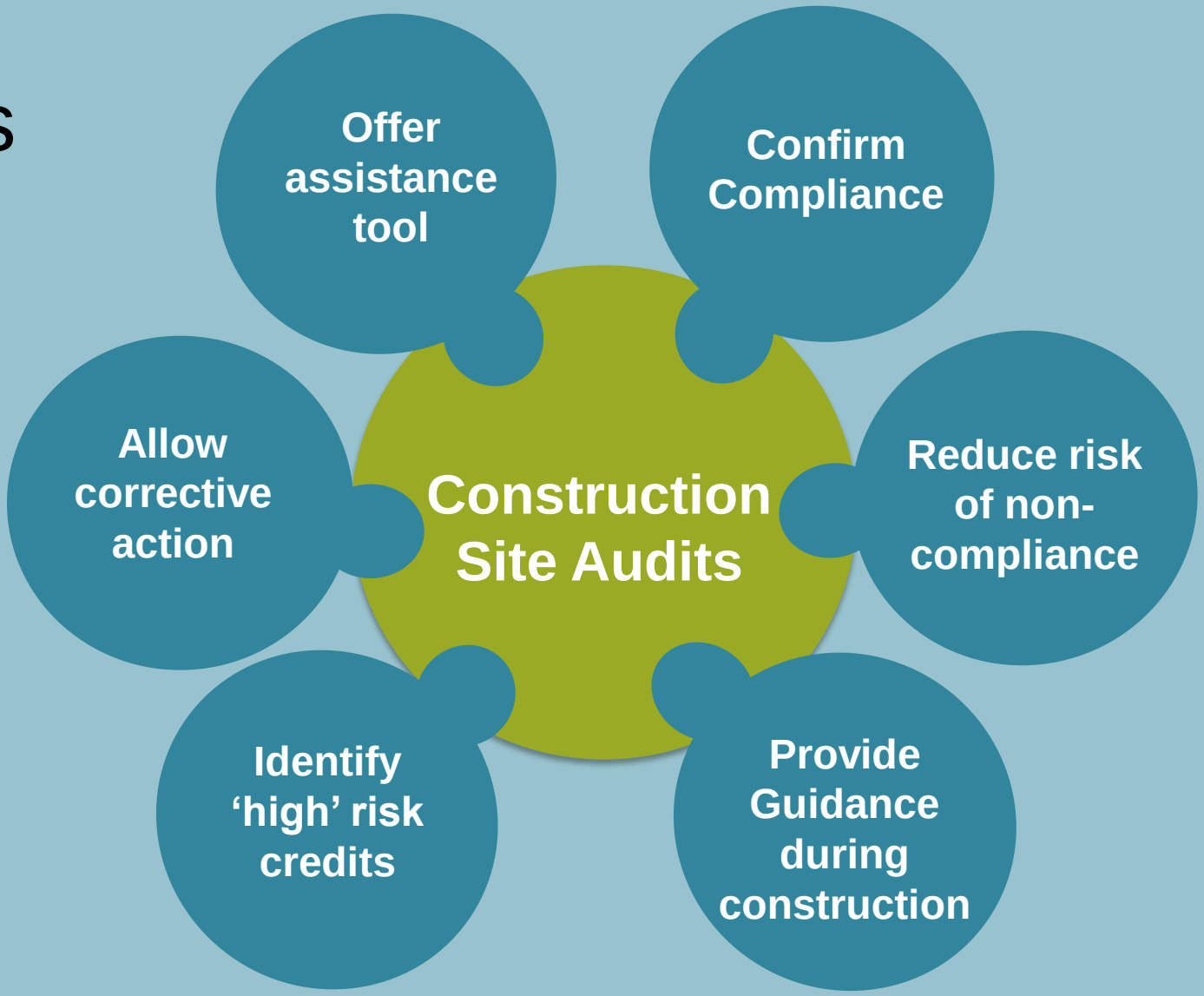
- Estidama is now part of Abu Dhabi's Built Environment
- We now have over **100** projects with a Design Rating
- Of this, we have over **50** under construction and **2** completed
- The vision is now a reality with industry effort and delivery
- We continue to help Design & Development Teams in ensuring the Design Rating will be realized at Construction.

Construction Rating Audits

Construction Site Audits are a process by which the UPC meet and assist the Design and Development Team to track a project's progress in achieving the targeted Pearl Rating

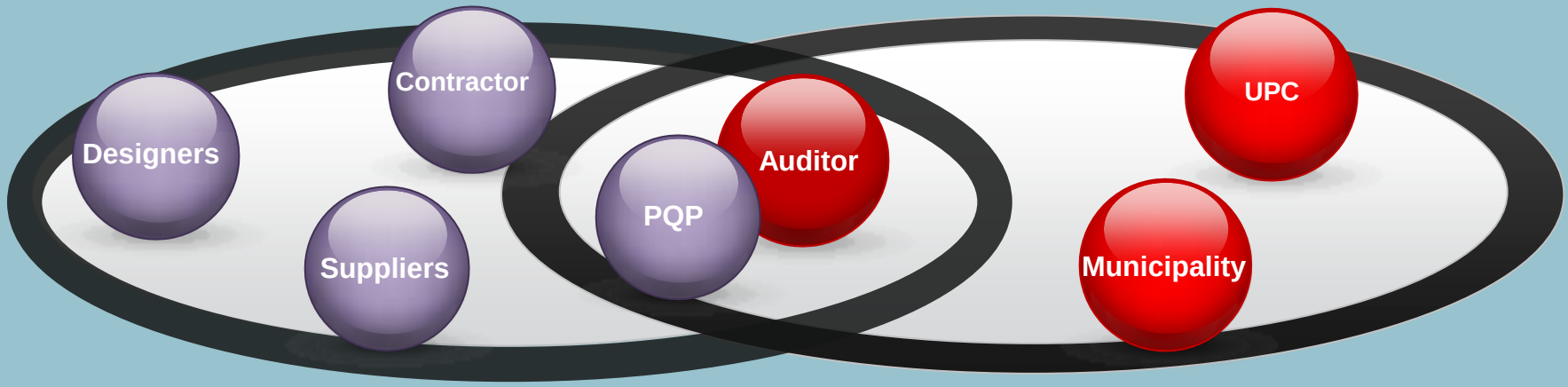
IT IS NOT A CONSTRUCTION RATING ASSESSMENT

Aims


Offer assistance tool
Confirm Compliance
Allow corrective action
Construction Site Audits
Reduce risk of non-compliance
Identify 'high' risk credits
Provide Guidance during construction

Responsibility for Credit Compliance

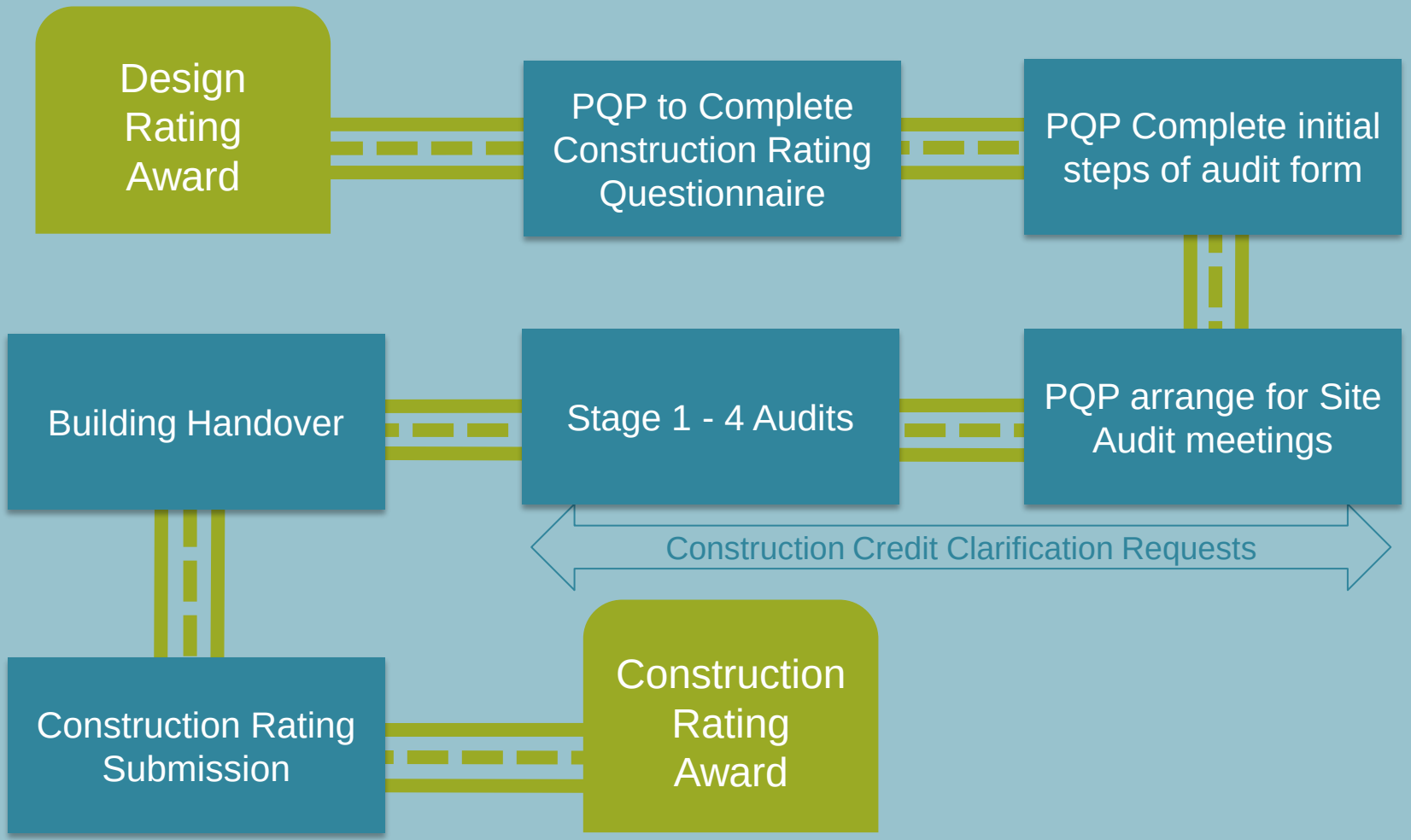
Design & Development Team **Government Organizations**



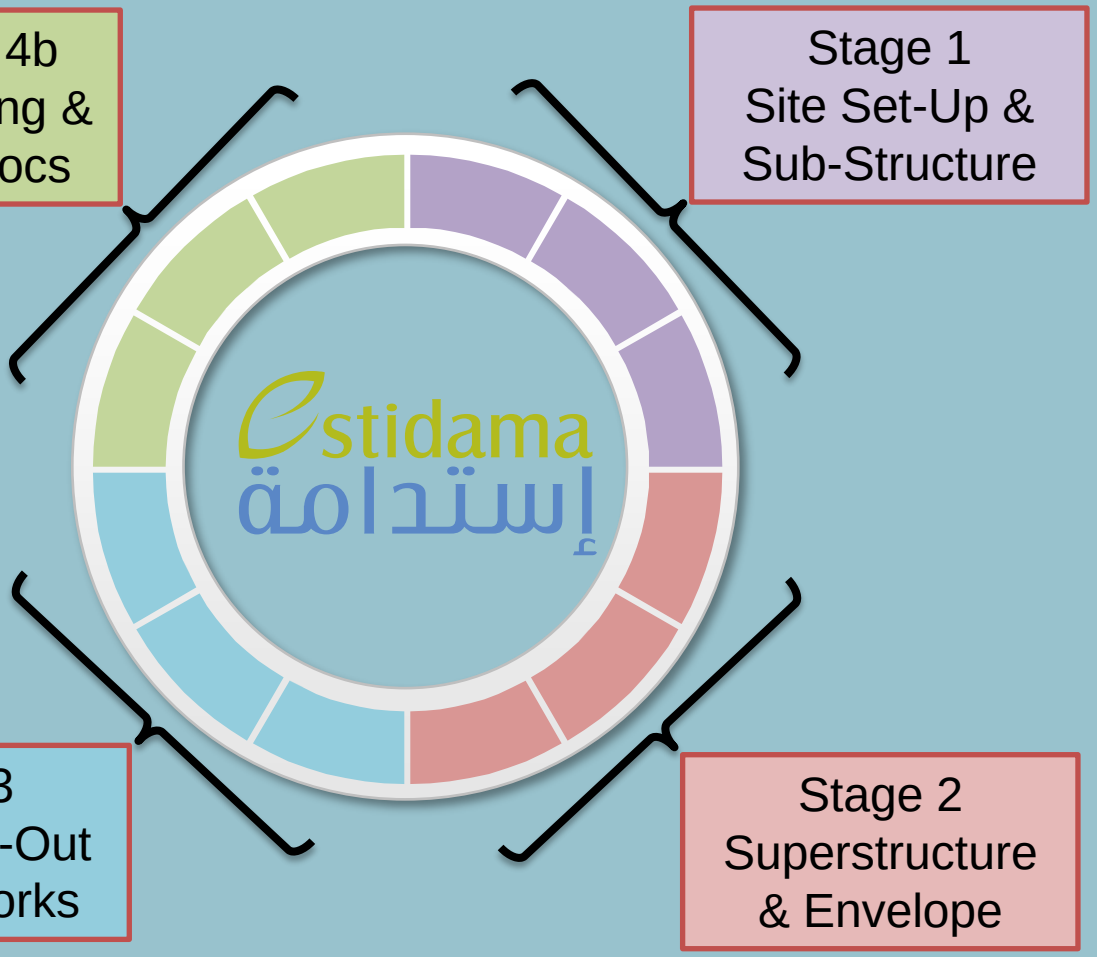
Audits are only an assistance tool
All responsibility for Estidama Credit Compliance lies with the Design & Development Team

Site Audit Stages and Process

The Construction Rating Process



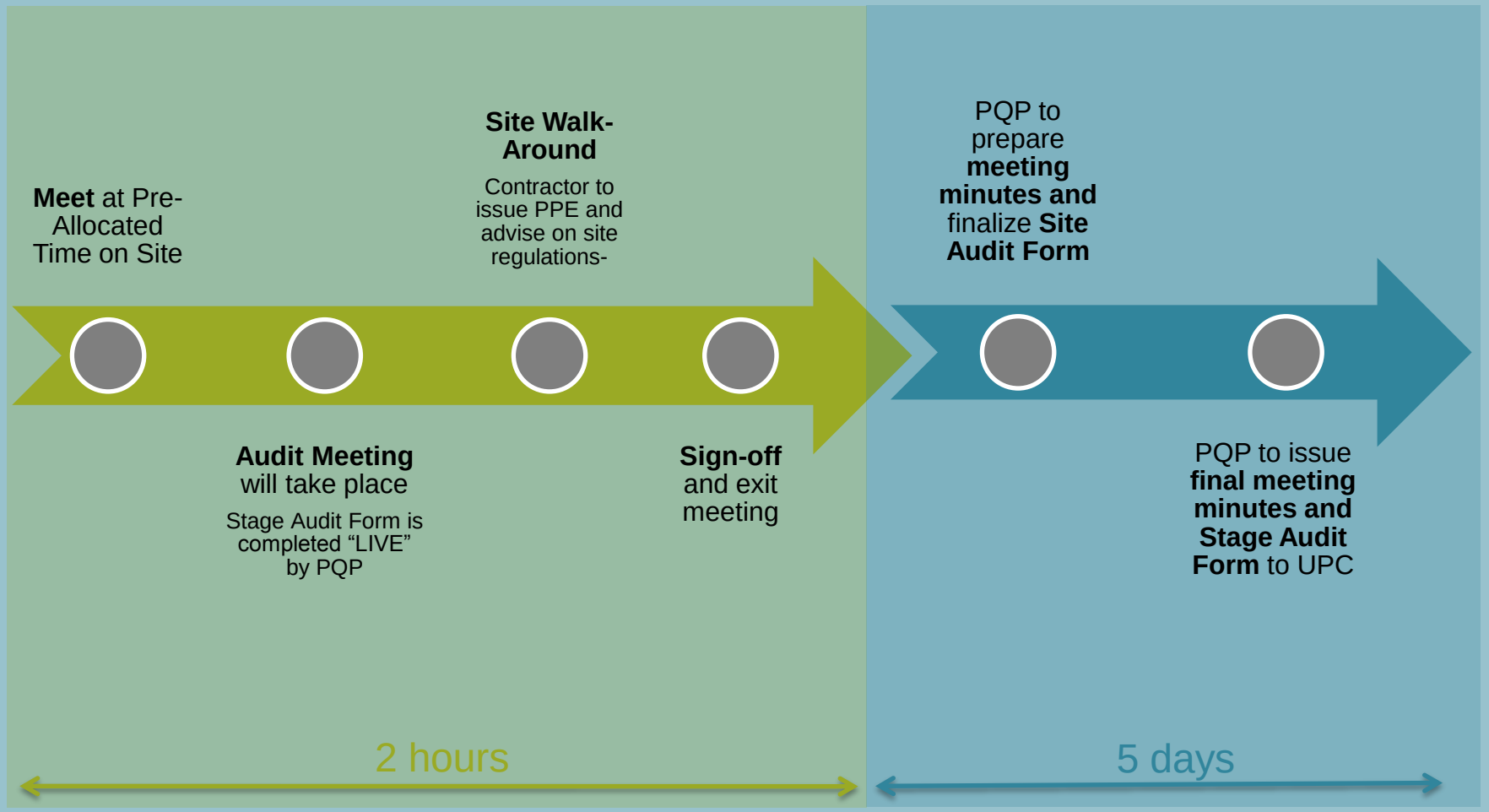
Construction Rating Audit Stages



Site Audit – Key Topics

- Estidama Awareness
- Procurement Process
- Natural Systems Strategy
- Construction Waste Management
- CEMP
- Sustainable Materials
- Envelope Verification
- Energy and Water Credits
- Legionella Risk Management
- Indoor Air Quality Management
- Commissioning
- Any relevant optional credits

Typical Site Audit Timeline



Site Audit – Case Study

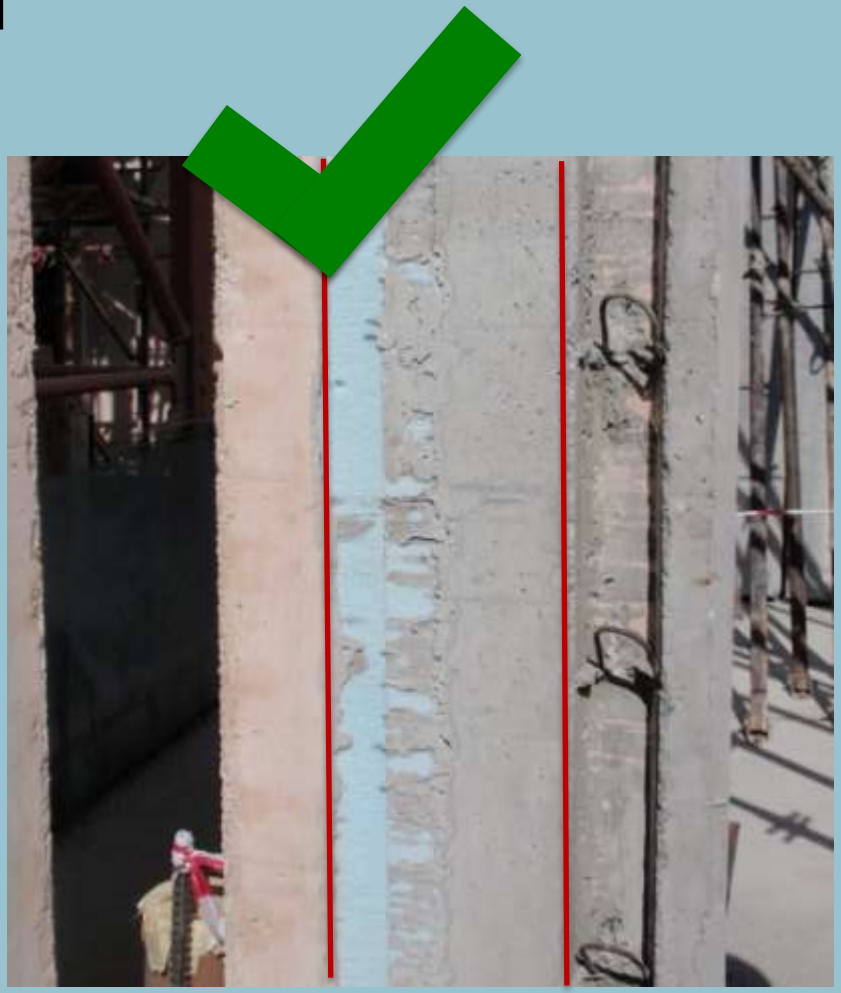
Site Audit – Envelope

- Envelope related Awareness Questions are in Stage 1 and Stage 2 of the audit process
- Responses to all questions link to minimum and improved energy performance or building envelope verification
- Team must demonstrate purchase of materials with appropriate U-Value
- Contractor must demonstrate that envelope elements have been installed appropriately
- All gaps should be appropriate sealed

Gap in Insulation

Envelope – Insulation

Incorrectly laid blocks / poor detailing



Insulation full length of wall

Envelope – Gaps

All gaps need to be appropriately sealed

Envelope – U-Values

- Third-party test certificate demonstrating thermal properties of insulation and other wall make-up elements

GOVERNMENT OF DUBAI

Dubai Central Laboratory

Engineering Materials Laboratory Section – Structural Unit

TEST REPORT

THERMAL TRANSMISSION PROPERTIES BY HEAT FLOW METER

REPORT NO.	: 2012008721	DATE	: 06/02/2012
WEB REQUEST NO.	: DCL/3001/2012/0105		
REQUEST NO.	: 2012006494	SAMPLE NO.	: 2012008831
PROJECT NO.	: PS-122		
PROJECT NAME	: TESTING SERV. FOR NATIONAL POLYSTYRENE PKG.FACTORY		
CONSULTANT	: NO SPECIFIC CONSULTANT		
CONTRACTOR	: NO SPECIFIC CONTRACTOR		
LOCATION	: NATIONAL POLYSTYRENE PACKAGING FACTORY - DUBAI		
SOURCE	: NATIONAL POLYSTYRENE PACKAGING FACTORY, DUBAI		
SAMPLE DESCRIPTION	: MOLDED (EXPANDED) POLYSTYRENE SHEET		
SAMPLE TYPE	: KINGPOR-S 24 TYPE II		
SUPPORT / FACING	: NIL		
NOM. THICKNESS (mm)	: 50		
NOM. DENSITY (kg/m³)	: NG		

Date of Sampling	: 28/01/2012	Time	: 10:00	Lot No.	: NG
Date of Receiving Sample	: 30/01/2012	Time	: 12:24	Lot Size	: NG
Size of Sample	: 1 pc	Area No.	: -	Sender No.	: NG

DATE SPECIMEN RECEIVED	30/01/2012
DATE TESTED	01/02/2012
NOM. THICKNESS OF SPECIMEN (mm)	50
TEMPERATURE, RH & TIME AT WHICH SPECIMEN CONDITION	38±2°C, 60±5% RH, 24 h

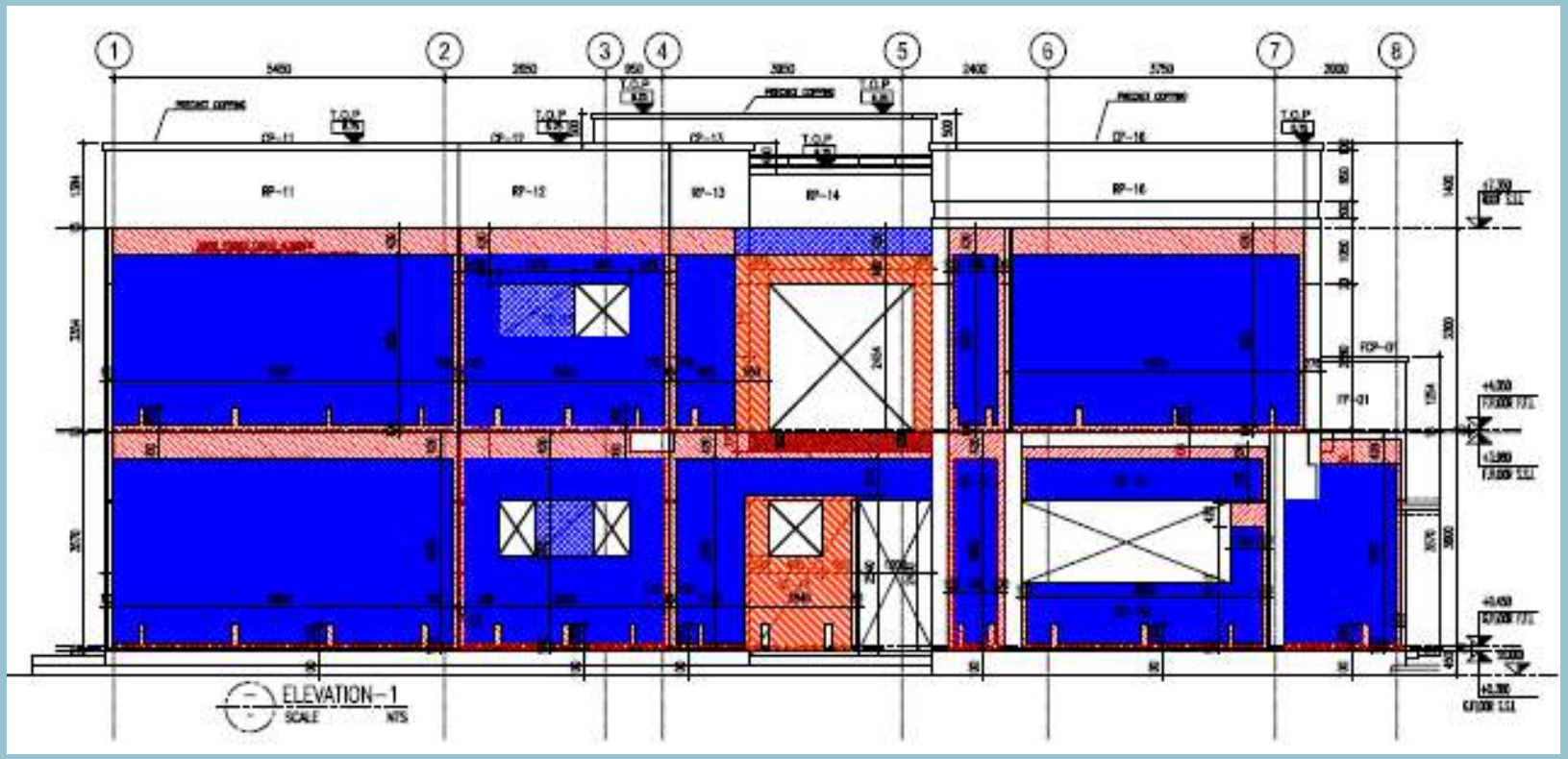
TEST / SPECIMEN NO	THICKNESS (MEASURED)	DENSITY (MEASURED)	MEAN TEMPERATURE	THERMAL CONDUCTIVITY		THERMAL RESISTANCE	
	mm	kg/m³	°C	W/(m·K)	Btu·in/h·ft²·°F	(m²·K)/W	°F·h·ft²/Btu
1/B	50.6	24.9	34.86	0.0325	0.2256	1.5565	8.8319

Uncertainty of measurement for thermal conductivity 0.0010 W/m·K at 95% confidence level, k factor 2.

Abridged ASTM C 518 Test Report.

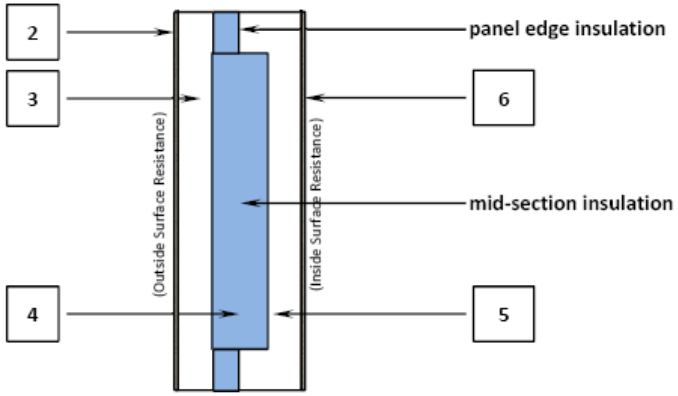
Envelope – U-Values

- Shop drawings highlighting envelope elements with different U-Values



Envelope – U-Values

- Elemental U-Value calculations
- PVRS U-Value calculator



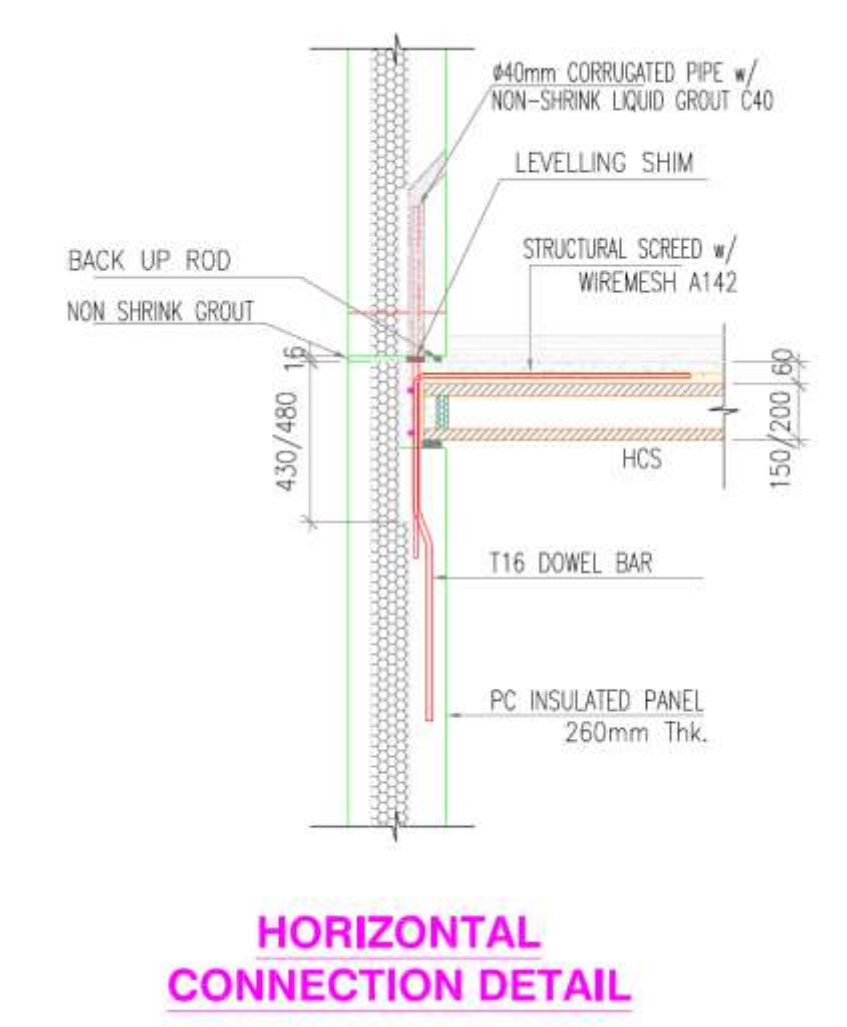
From Test Results for Panel Edge Insulation Provided from DCL:

Thickness of POLYSTYRENE	t =	75	mm
Thermal Conductivity	k =	0.0325	W/m.K
	1 / k =	30.769	m.K/W
Thermal Resistance (t / k)	R =	2.308	m^2.K/W

Panel Edge U-value Calculation:

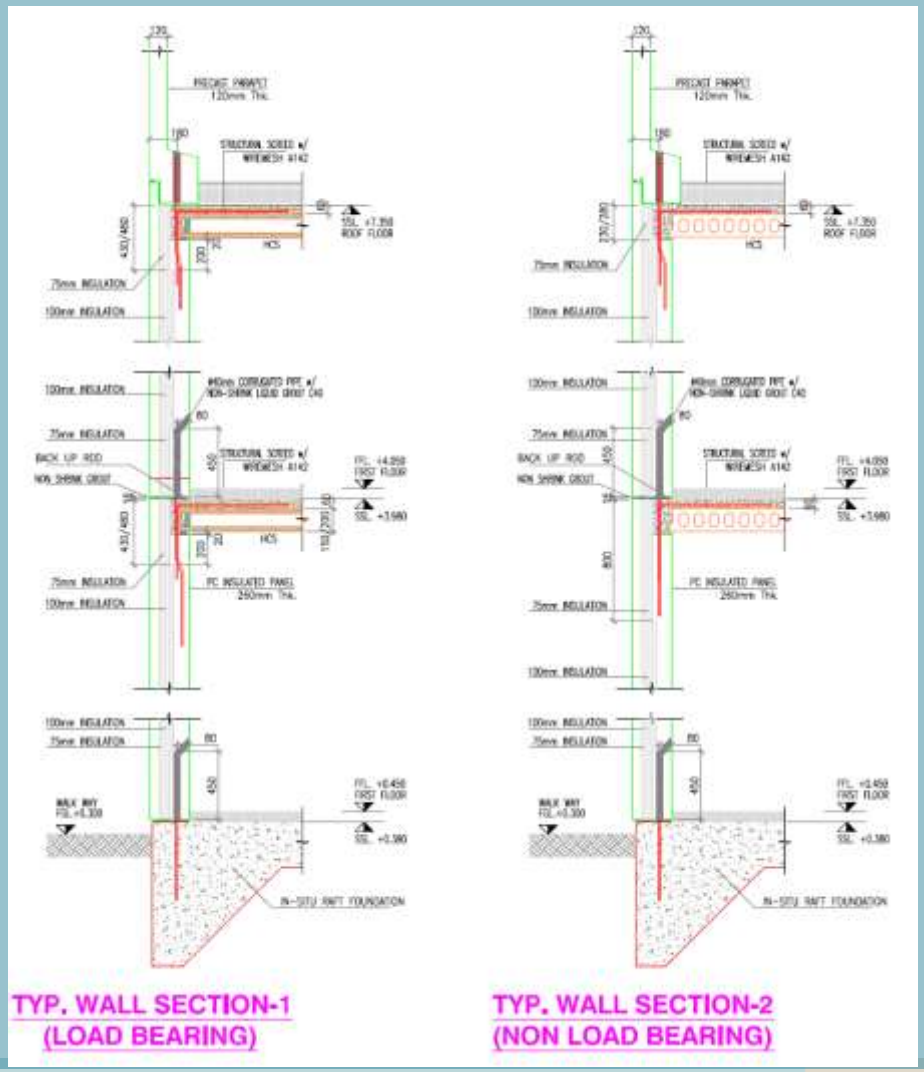
LAYER	THICKNESS mm	DESCRIPTION	1/k m.K/W	R m^2.K/W	REFERENCE
1	-	Outside Surface Resistance	-	**0.050**	PCI Code Calculations
2	-	Plaster	-	-	PCI Code Calculations
3	**50**	Dense, reinforced concrete	**0.526**	**0.026**	PCI Code Calculations
4	**75**	EXPANDED POLYSTYRENE	**30.769**	**2.308**	DCL Test
5	**115**	Dense, reinforced concrete	**0.526**	**0.061**	PCI Code Calculations
6	-	Plaster	-	-	PCI Code Calculations
7	-	Inside Surface Resistance	-	**0.127**	PCI Code Calculations
TOTAL	**240**	**TOTAL**	**31.822**	**2.572**	

Envelope – U-Values

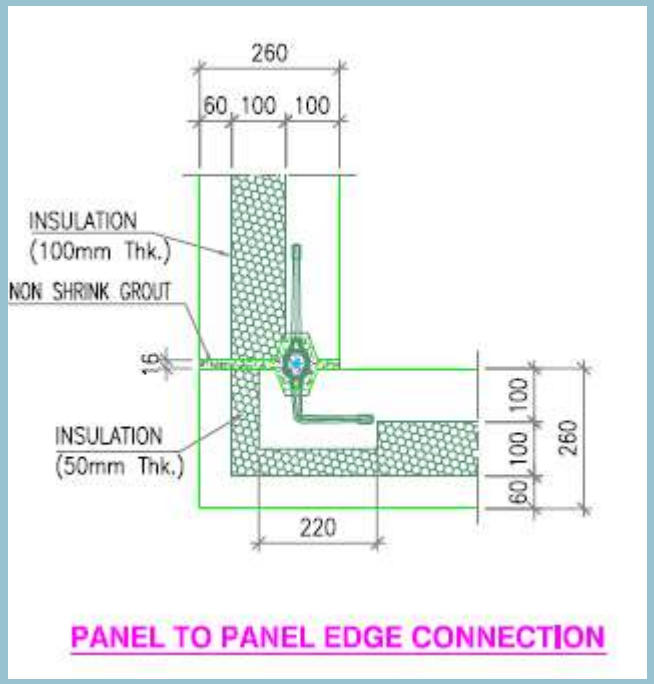


HORIZONTAL CONNECTION DETAIL

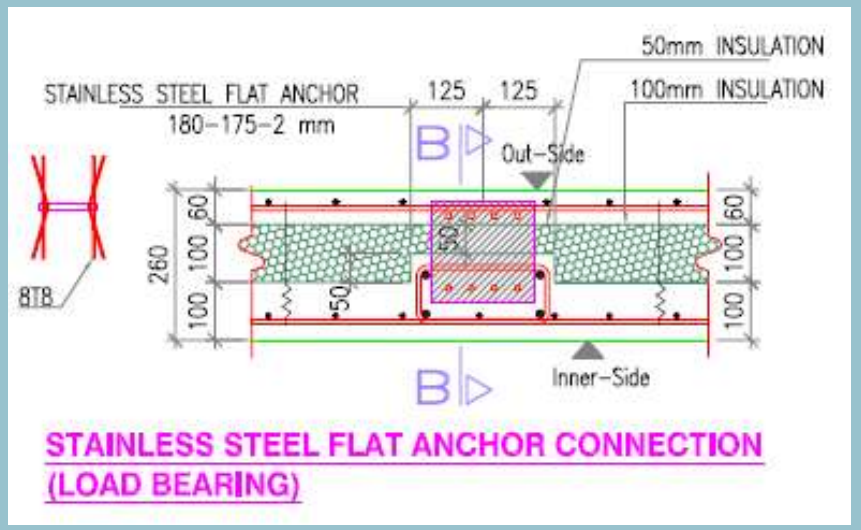
Envelope – U-Values



Envelope – U-Values



PANEL TO PANEL EDGE CONNECTION



STAINLESS STEEL FLAT ANCHOR CONNECTION
(LOAD BEARING)

Envelope – U-Values

- Area weighted average U-Value calculations

U-Value = (A1 x U1 + A2 x U2 + An x Un) / (A1 + A2 + An)

Wall Description	AREA OF THE CROSS SECTION (m^2)
Area of 240mm walls, 140 mm insulation thickness	547.522
U - VALUE ($W/m^2 . K$)	0.275
Area for edge of 240mm walls, 75 mm insulation thickness	165.929
U - VALUE ($W/m^2 . K$)	0.389
Area for 240mm walls, with 100 mm insulation near grout tubes	6.960
U - VALUE ($W/m^2 . K$)	0.301
Area for 16 mm horizontal joint	1.951
U - VALUE ($W/m^2 . K$)	1.240
Area for 16 mm vertical joint	1.946
U - VALUE ($W/m^2 . K$)	1.240
TOTAL AREA (m^2)	724.308
AVERAGE U-VALUE	0.306

Estidama Villa Products Database

- Over 600 technically compliant products:
  - Water Fittings & Fixtures
  - Solar hot water systems
  - Glazing
  - Air Conditioning Units
  - Insulation Products and Systems:
    - Pre-Cast
    - Insulated Block work
    - AAC Blocks
    - Insulated Concrete Form
    - Rigid Insulation Board
- These are NOT certified products but rather products that comply with technical requirements of water and energy performance.
- Only products are approved as compliant, NOT suppliers.

Final Remarks

- Design Rating is the beginning of the sustainability journey to achieving a better built environment for Abu Dhabi
- Compliance with Estidama is demonstrated at Construction. PQP is responsible for approving envelope compliance prior to submission to UPC.
- Construction Audits help project teams maintain and improve the achieved Design Rating.
- Thoughtful designs result in more sustainable buildings.
- UPC is always available to meet project teams and work together in the most sustainable solution for your project.

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Comments & Questions

Abu Dhabi رؤية 2030 Vision

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