

*Introduction:*

*The Lebanese Environmental Action (LEA) is a national financing mechanism dedicated to the financing of loans in water, air and the environment. LEA is a joint initiative between the Central Bank of Lebanon (BDL) and the Ministry of Energy and Water (MEW).*

*As part of the contract signed between the BDL and the LCEC under the name "Technical Support Consultancy Services Agreement in Energy Efficiency and Renewable Energy", the Technical Support Unit to the Central Bank of Lebanon (BDL) at LCEC is dedicated to offer BDL technical assistance to evaluate the eligibility of submitted loans under LEA.*

*Important Notes:*

1. *This project proposal guideline is designed to help potential beneficiaries, consultants, and contractors in preparing comprehensive technical reports and proposals about roof tiling measure.*
2. *This project proposal template is a mandatory requirement towards facilitating the green loan application process through the national financing mechanism LEA.*
3. *This project proposal template is prepared by the Lebanese Center for Energy Conservation- Technical Support Unit to the Central Bank of Lebanon, and is available for public use.*
4. *This guideline will be updated constantly, kindly always refer to the latest version.*
5. *For questions, clarifications, or suggestions, please contact the LCEC: 01-569101 or by email:* [*energy@lcecp.org.lb*](mailto:energy@lcecp.org.lb)

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| ***Evaluation of projects requesting financing of roof tiling measure under LEA will be based on these issued Guidelines. Contractors are entailed to abide by the requirements set in these guidelines and must submit the technical reports following the steps and regulations clearly identified.*** |

1. **Introduction**

Red-tiled roof is an authentic architectural feature in the design of a traditional Lebanese house. Since the late 19th Century, red tiles have served to cover flat roofs, made of compacted mud. Until date, red roof tiles are used across different regions and villages in Lebanon for its ability of being able to accent and complement the exterior design of the building and of its surrounding environment.

1. **Why Roof Tiling?**

In addition to its positive aesthetical impact, roof tiling contributes to positive environmental impacts as well. Based on the different types and composition, roof tiling can be a durable and cost effective solution to improve the thermal and acoustic performance of the building while providing unique and identifiable look to the building.

“Heat island effect” is an environmental concern that describes the built up areas that are hotter than the surrounding due to the exposed surfaces that slowly release the heat back into the atmosphere, especially during the night. Roofs and other non-reflective, dark, and solid surfaces like hard paving, concrete terraces, dark horizontal shading elements, roads, parking structures, and even open fallow lands absorb the incident sunlight and transfer it to the interior of the building, making the indoor temperature hotter than it should be. At a macro-level, the excess of hot surfaces results in increased temperatures in an entire urban core. Heat islands can affect communities by increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality.

As such, selecting the right roof tile plays a crucial role in reducing Heat Island Effect in order to minimize its effects on microclimates, human and wildlife habitats.

1. **Requirements under LEA**

Roof tiling is an eligible measure to be financed under the Lebanese Environmental Action (LEA) financing mechanism. However, to mitigate the impacts of Heat Island Effect, the measure is recommended to abide by the requirements listed below:

The designed roof should fall under the category of **“Cool Roof” (refer to Annex I)**. “Cool roof” is one that reflects most of the incident sunlight and efficiently emits some of the absorbed radiation back into the atmosphere, instead of conducting it to the building beneath, maintaining a lower roof temperature than traditional roods. “Cool Roof” refers to the outer layer or the exterior surface of the roof, which acts as the key reflective surface.

The roof tiling measure within the project proposal submitted to the environmental loan under LEA should contain the following information:

* Total surface area covered;
* Roof structure specs identifying roof slope or pitch;
* Selected roof tile specification

|  |  |
| --- | --- |
| Brand | *Insert text here* |
| Type | *Insert text here* |
| Composition | *Insert text here* |
| Classification (Refer to Annex II) | *Insert text here* |
| Color | *Insert text here* |
| Average Water Absorption (%) | *Insert text here* |
| Solar Reflectance or SRI of surface material (Refer to Annex I) | *Insert text here* |
| Durability (Years) | *Insert text here* |

* Roof system components and quantity of each (standard tile, verge tile, exhaust tile, ridge tile, etc.);
* Supporting structure description (rafters, ridge beam, battens, etc.)
* Datasheet of the selected roof tile (Refer to Annex I);
* BOQ that should include:

1. component cost
2. Supporting structure cost
3. Installation Cost
4. Overall cost per meter square

**Annex I**

Datasheets of the roof tiling units must present one of the below properties within the indicated ranges:

**Option 1: Solar Reflectance**

Solar Reflectanceis the fraction of sunlight reflected by the surface. Sunlight that is not reflected is absorbed as heat. Solar reflectance is measured on a scale of 0 to 1.

The surface material used within the measure of the project proposal submitted under LEA is recommended to abide by the values stated in the table 1.

Table 1 Solar Reflectance Values for cool roof tiles (Energy Star)

|  |  |  |
| --- | --- | --- |
| Roof Type | Initial Solar Reflectance | 3-Year Aged Solar Reflectance |
| Low Sloped\* | 0.65 | 0.50 |
| Steep Sloped\*\* | 0.25 | 0.15 |

AND/OR

**Option 2: Solar Reflectance Index**

Solar Reflectance Index (SRI) is another metric for comparing the “coolness” of roof surfaces. It is calculated from solar reflectance and thermal emittance values. The higher the SRI, the cooler the roof will be in the sun.

The surface material used within the measure of the project proposal submitted under LEA is recommended to abide by the values stated in the table 2.

Table 2 SRI values for cool roof tiles (ANSI/ASHRAE/USGBC/IES Standard 189.1-2009)

|  |  |
| --- | --- |
| Roof Type | Initial SRI |
| Low Sloped\* | 78 |
| Steep Sloped\*\* | 29 |

As defined in proposed ASTM Standard E 1918-97

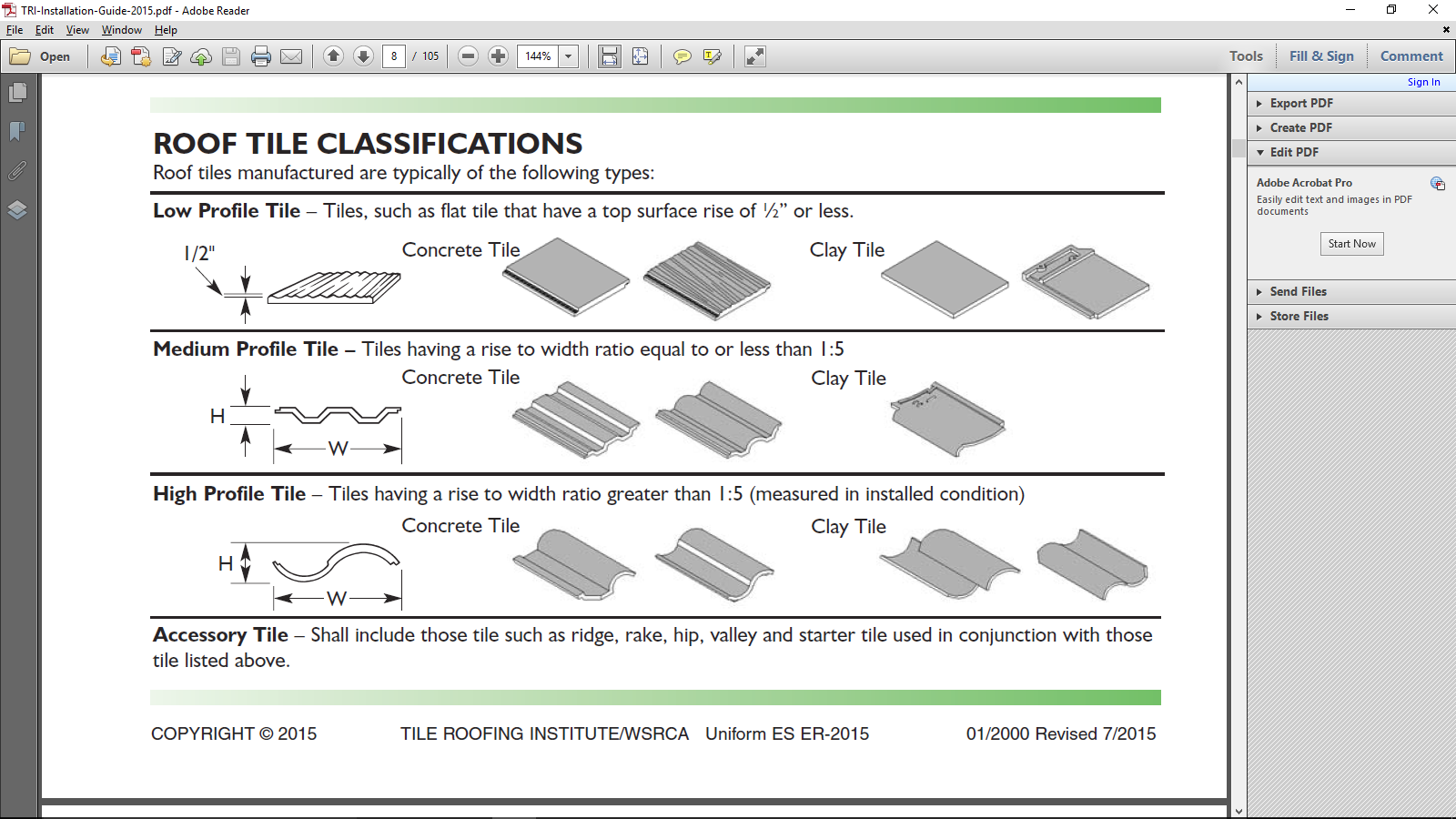
\*Low Sloped Roof: Surfaces with a slope of 2:12 or less (Pitch of 9.46° or less)

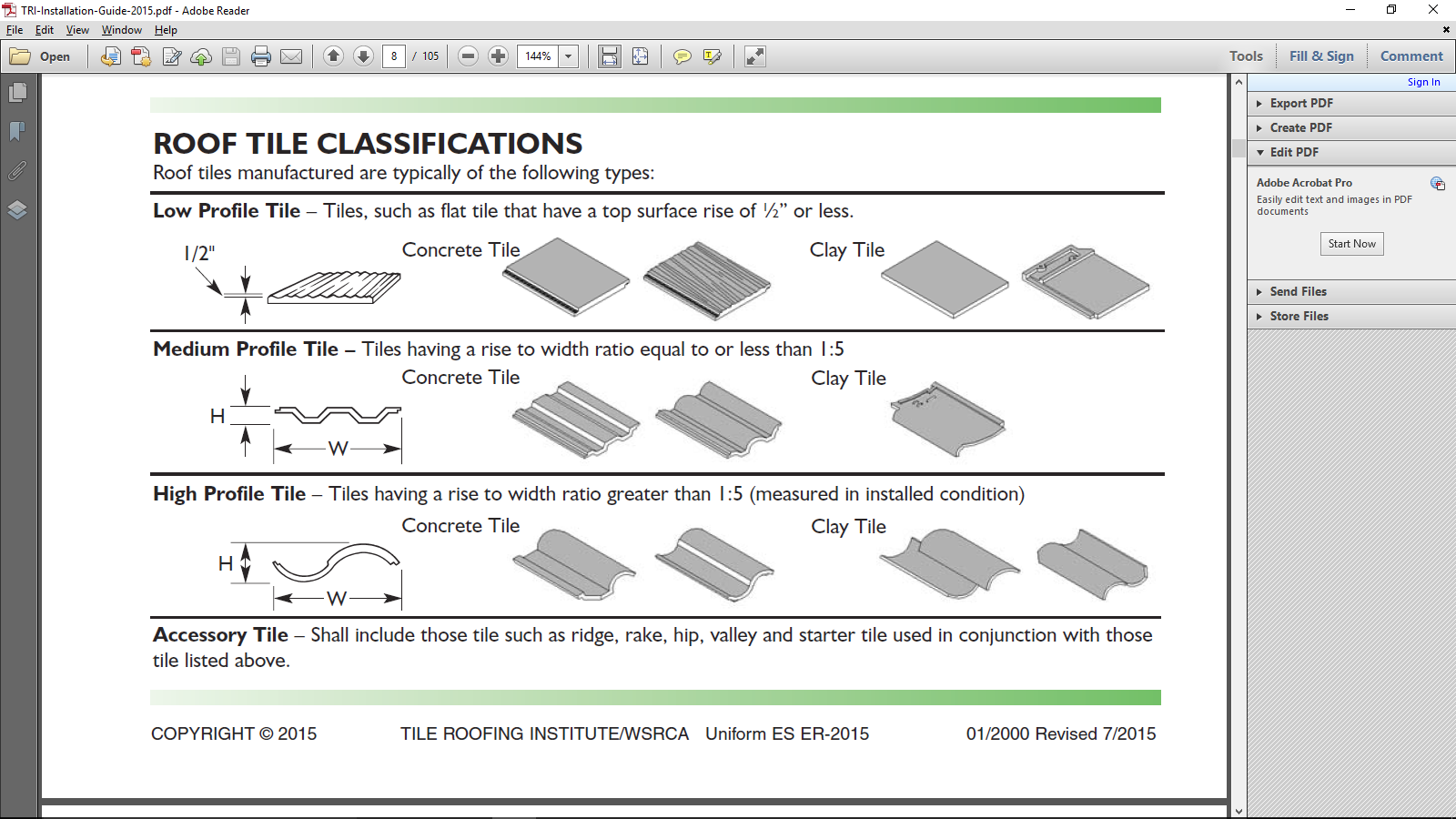
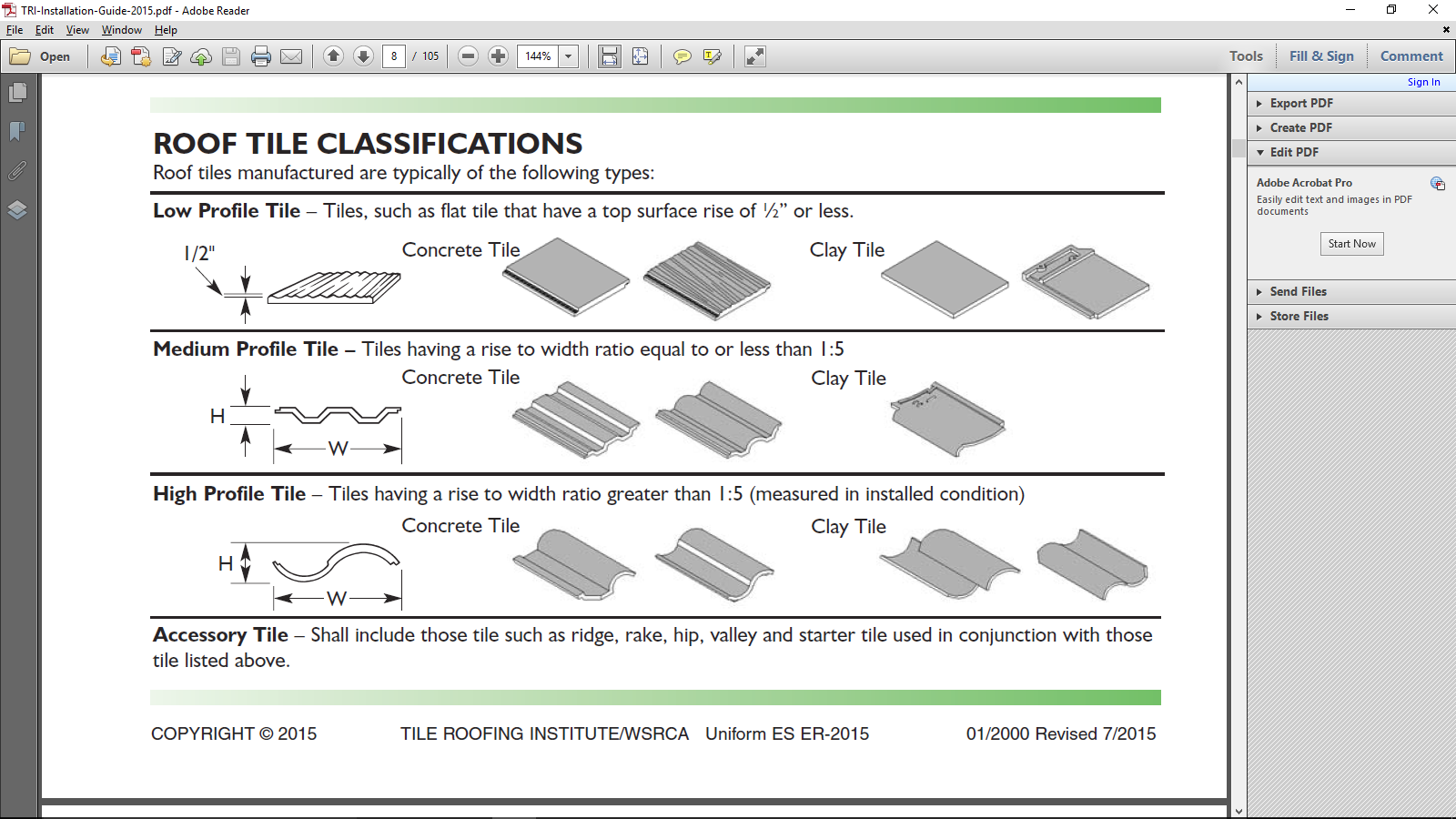
\*\*Steep Sloped Roof: Surfaces with a slope greater than 2:12 (Pitch greater than 9.46°)

**Annex II**

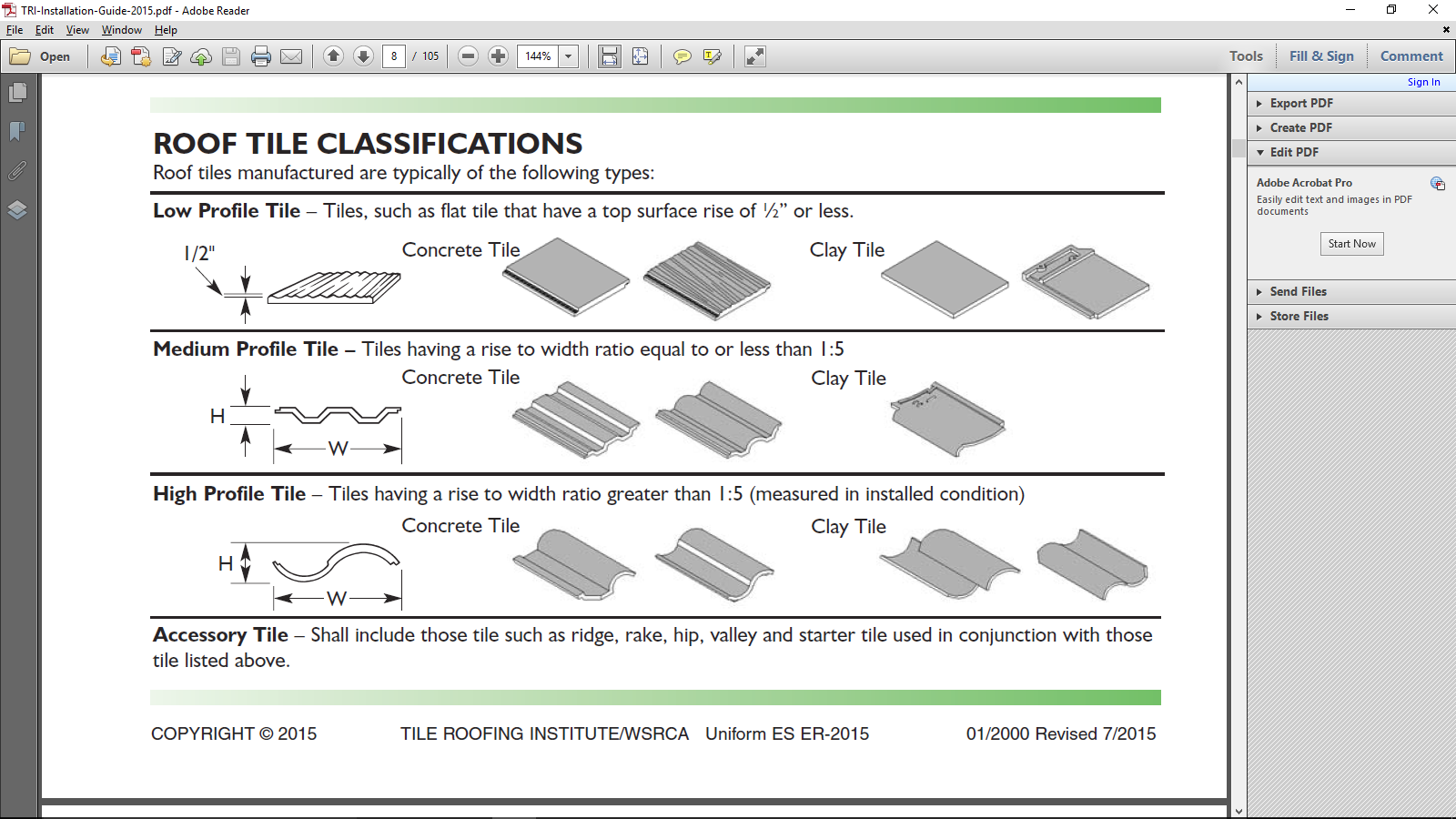
**Roof Tile Classifications**

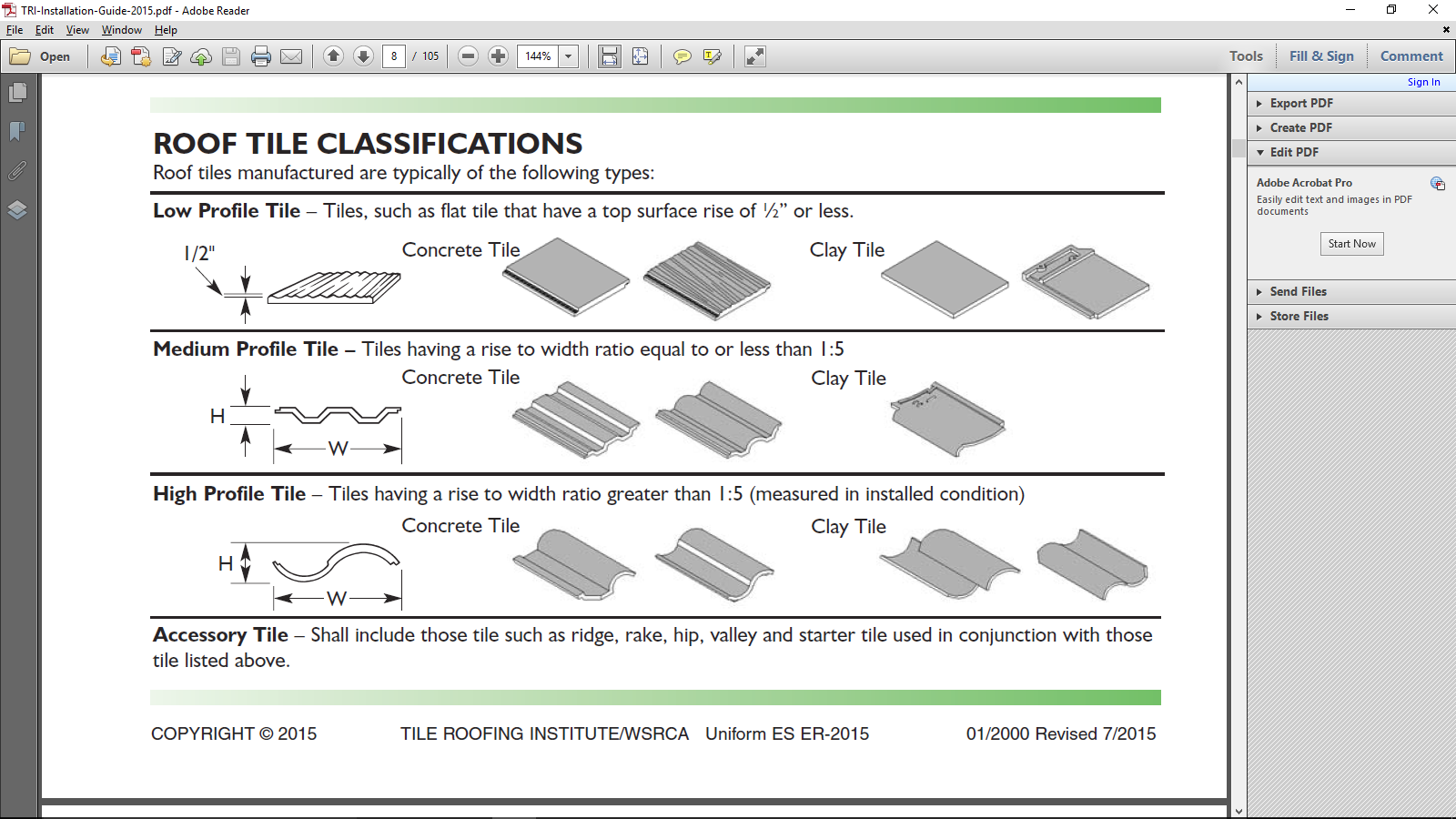
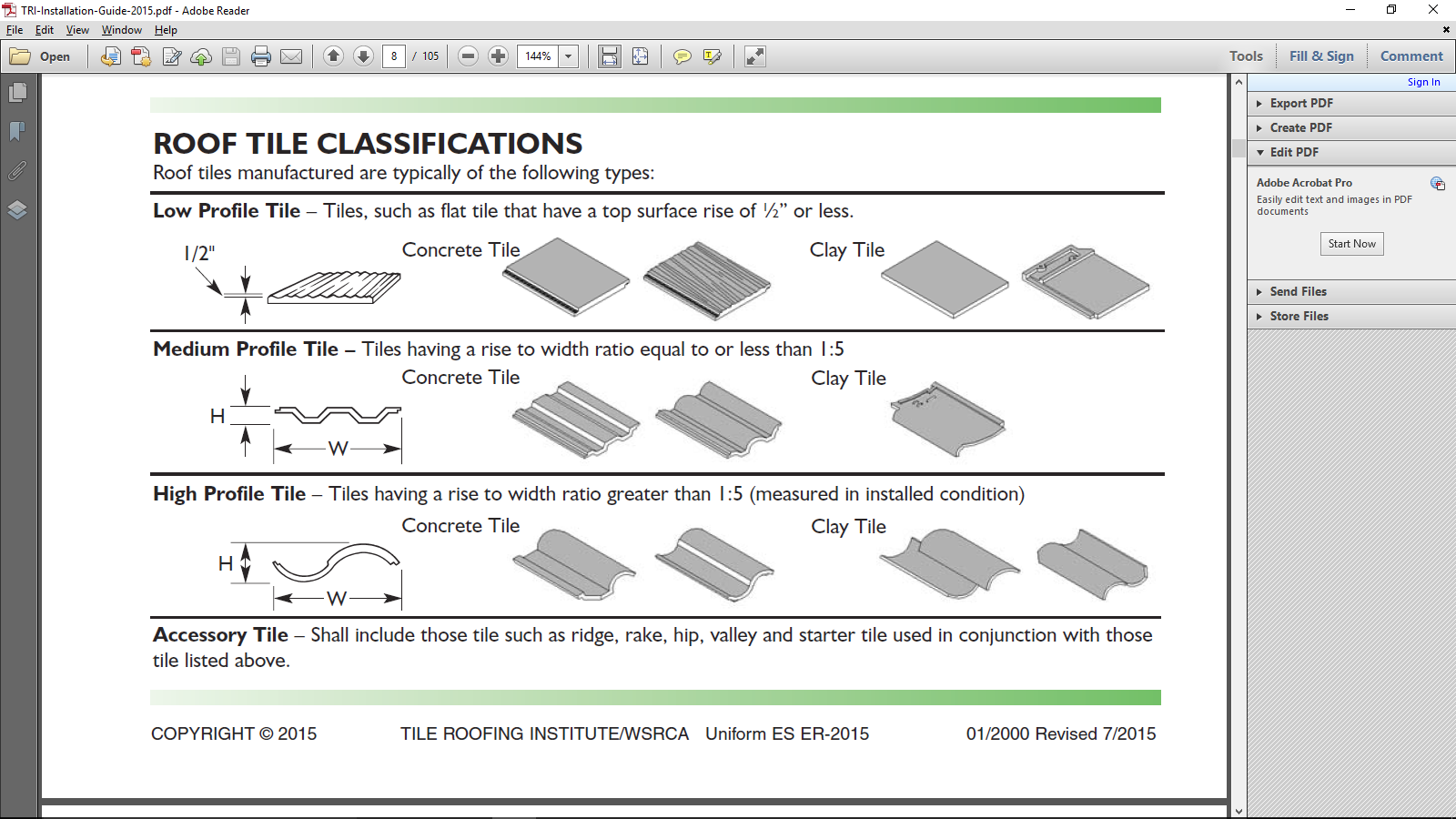
1. **Low Profile Tiles have a top surface rise of ½” or less**





1. **Medium Profile Tiles have a rise to width ratio equal to or less than 1:5**



1. **High Profile Tiles have a rise to width ratio greater than 1:5 (measured in installed condition)**

