CATapult (Consumer Access Terminal) Rural Mount Design Contest

Rev. (-) July 20, 2016

REVISION HISTORY

Revision	Date	Author	Description
-	7/20/16	J. Wallace	Initial Release

CONTENTS

CONTENTS ii
1 FOREWORD iii
1.1 Acronyms and Definitions iii
2 Problem background 1
2.1 Introduction 1
2.2 Project Need 2
2.3 Design Contest 2
3 Design Guidelines 3
3.1 Design Functionality 3
3.2 Design Envelope 3
3.3 Configurations 3
4 Project deliverables 5
4.1 Project Deliverables 5
[redacted] **CAD modeling of proposed design using provided OnShape CAD tool** 5
[redacted] **Detailed explanation of clamping mechanism** 5
[redacted] **Production assessment for producibility and cost** 6
[redacted] **Evaluation of overall applicability** 6
4.2 Project Criteria 6

1 FOREWORD

This document describes a design effort to develop a mounting solution for the CATapult for rural areas. It is intended to be a design contest hosted by the Mexican Space Agency. This contest will involve university students from Mexico in a mechanical design challenge. Student involvement in the contest will be voluntary, and no financial compensation will be provided. At the end of the contest, there will be a TBD prize for the winning design.
The design challenge will be to develop a mechanical concept for a no tool terminal installation clamp for rural areas. With many of these students having exposure to these rural environments throughout their lives, they bring a unique perspective on what would be a feasible no tool mechanical design.

The project will be broken into the 4 phases listed below.

1. Publication of the call for opportunities.
2. Reception of initial proposals, filtering the best and choosing 3 to 5 semifinalists
3. Opening the design software to the semifinalists and accept their designs.
4. Selecting the best design and award the prizes.

1.1 Acronyms and Definitions

The following acronyms are provided for reference used throughout this document.

Acronym	Definition
CATapult	Community Access Terminal
Terminal	A ground based point of connection to a satellite network

Table 1.1 Acronyms and Definitions

2 PROBLEM BACKGROUND

2.1 Introduction

While internet access is crucial for education, economic development, telemedicine and digital government, rural deployment to date has been extremely difficult.

- Rural schools lack the local experience to install and maintain internet infrastructure.
- High Speed, Low Latency Broadband has not been available.
- Virtual classrooms and remote HD kiosks are proven effective tools used even by the most advanced institutions, but they depend on this internet access.

Internet access systems are complex requiring multiple disciplines (hardware, software, and network engineering). Most institutions rely on full time well trained and motivated IT personnel because the benefits of reliable high speed, low latency internet are tremendous. Interactive Virtual Classrooms let any child participate giving them access to the world's best teachers and proven educational models. Access to internet research allows questions to be answered quickly – letting the children chase their interests, drawing them towards self-directed learning.
OneWeb was founded on the principle that the Internet could become this great equalizer but for this to happen we must reduce the cost and complexity of bringing Internet to rural populations.
For rural connectivity, reliability is usually the hardest obstacle. How can a student reliably access the internet without a local IT team? There are a lot of things that can go wrong between the turning on of a laptop and achieving connectivity.

Figure 1.1 Rural School User Terminal Example with Solar Power

2.2 Project Need

One of the barriers to connecting rural schools is the deployment of the ground antenna system that accommodates the resources of all schools. For many rural schools a self-installed antenna system is the only viable option for connectivity. Focused on that mission, OneWeb is currently developing a small lightweight ground antenna that will have a modular base/clamp, allowing allow it to be installed without any tools.

2.3 Design Contest

OneWeb in collaboration with the Mexican Space Agency is hosting a collaborative design challenge for the clamp. The clamp is a mechanical bracket that allows for no tool installation onto buildings. This clamp will need to have accommodations for multiple roof thickness, and orientations.

The base will also allow for the easy installation of a domed antenna. A sample interface between the clamp and the antenna is provided in the drawings in the appendix of this document to allow for a slide-in installation once the base is installed/clamped onto a structure.

3 DESIGN GUIDELINES

3.1 Design Functionality

The design of this clamp will be highly dependent on local factors, in addition to the provided antenna and roof interface. While there are an infinite number of structure types and materials, this project will focus on 2 specific roof types to design a mounting system around. In addition to general engineering principals and manufacturing techniques, OneWeb is looking to gain the experience of designers & engineers who may have more exposure to rural area challenges to guide the design direction to accommodate the maximum number of users.

3.2 Design Envelope

An established design envelope is provided for the clamp to fit within. See figures below and drawing in the appendix. The ISM (Interface Solid Model) of the clamp is in the fully open configuration. The installed (clamped) configuration will presumably violate this model with a clamping feature that grabs the building. This is considered to be acceptable.
While the entire envelope/volume has been provided, it is important to note that there is a desire for the clamp to be as small and aesthetically pleasing as possible.

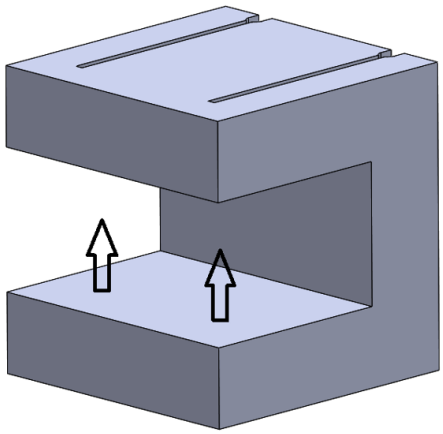


Figure 1.2 (Clamp Interface Solid Model ISO view)

3.3 Configurations

This single clamp will accommodate 2 specific building configurations.

- **Building Configuration #1:**
    a. This configuration is an Eave Mount. The Eave mount clamps on an overhanging portion of a roof with the antenna mount facing the sky (normal to the roof).

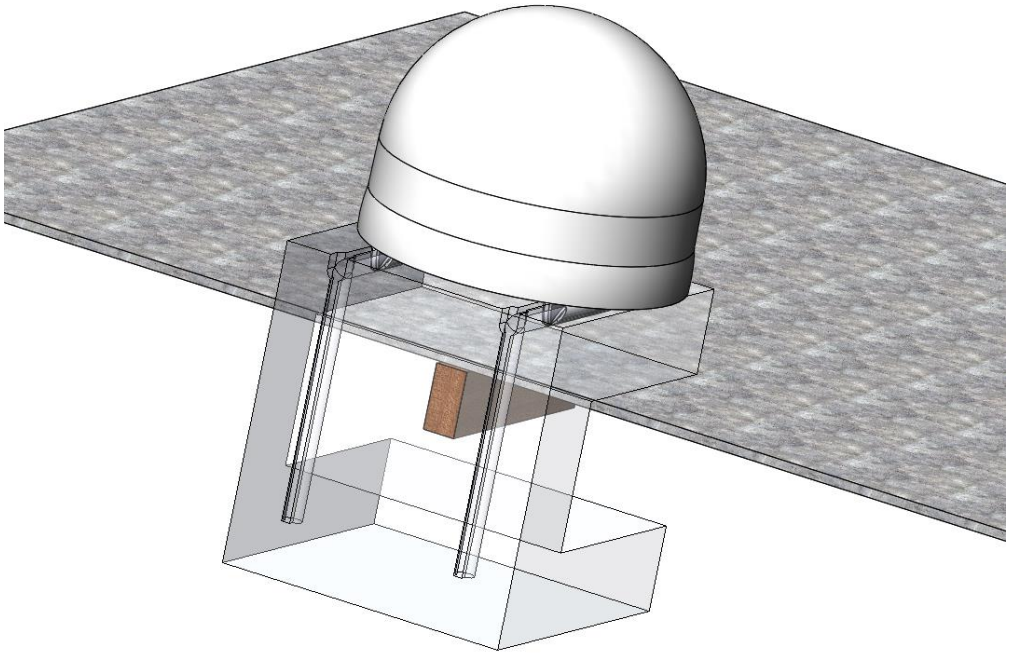


Figure 1.3 As Installed Eave Mounting

- **Building Configuration #2:**
    a. This configuration is the Parapet Mount. This clamp will accommodate buildings with a flat roof/half wall type of construction. In the as installed condition, this clamp will have a provision to mount the antenna facing the sky.

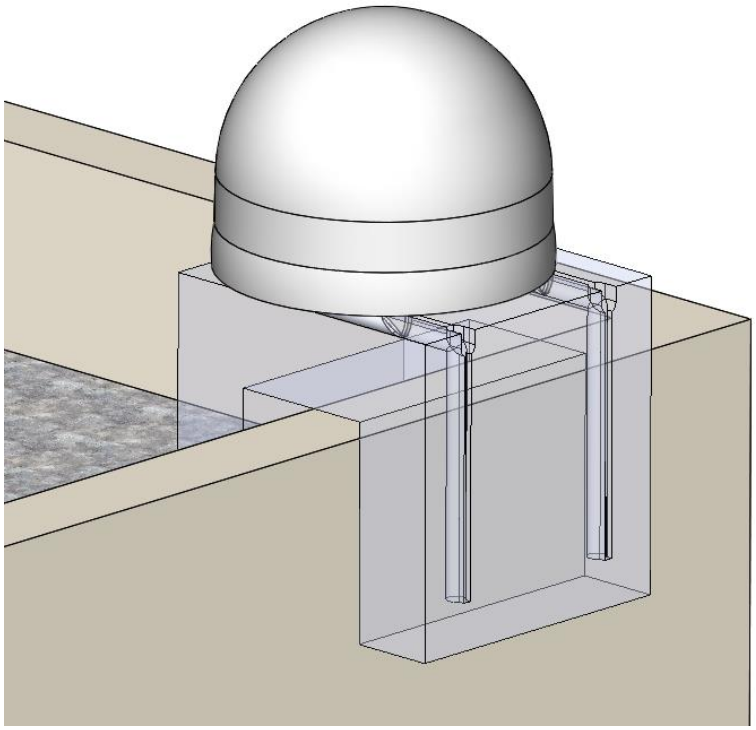


Figure 1.4 As Installed Parapet Mounting

4 PROJECT DELIVERABLES

4.1 Project Deliverables

CAD modeling of proposed design using provided OnShape CAD tool

The modeling portion of this design will use Onshape. OnShape is a fully cloud based 3D CAD system that allows a design team simultaneously work together using a web browser, phone or tablet. To participate in the contest, designers will sign a release which will allow them access to the tool. Teams are encouraged to use the tool to communicate their design solutions.

Detailed explanation of clamping mechanism

Teams are encouraged to provide an explanation of use, including hand force required to actuate device, resulting clamping force, and an assessment of the clamped surface variation accommodation.

Production assessment for producibility and cost

Teams will provide a description of individual parts & proposed manufacturing processes. Bill of Materials assessment of production level cost @ 200,000 units should also be performed.

Evaluation of overall applicability

For this project to have the maximum impact, it will need to have utility across a wide variety of building types. While the contest has addresses 2 specific types of building construction to accommodate, it is understood that there are varied construction types throughout Mexico. Each team should evaluate additional construction types that are commonly found within Mexico, and highlight any additional applications that their design supports.

4.2 Project Criteria

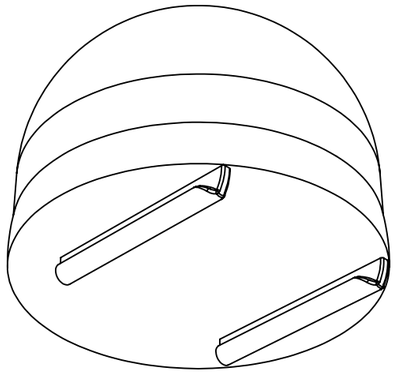
The designs will be qualified according to the following criteria:

a. Originality
b. Ease of installation
c. Ease of fabrication and assembly
d. Easiness to maintain
e. Use of standard parts
f. Cost
g. Availability of materials
h. Ruggedness

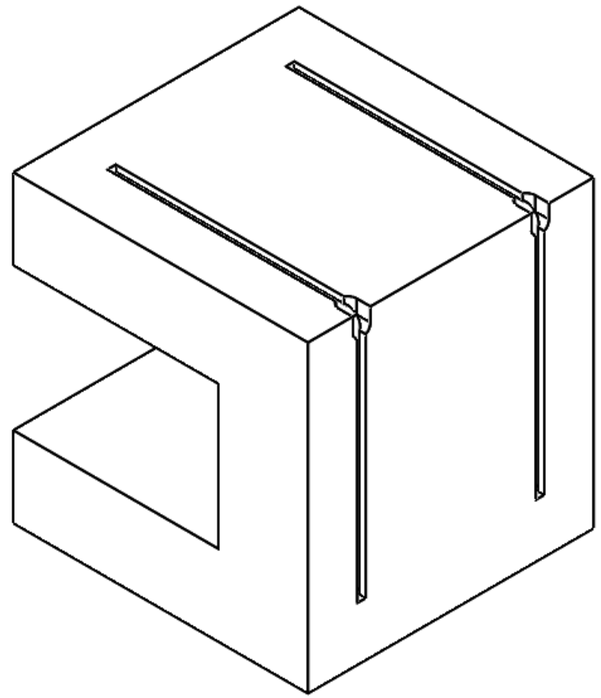
ONEWEB DATA				SUPPLIER DATA	
PART NUMBER	**DESCRIPTION**	**SPECIFICATION**	**STATEMENT OF WORK**	**NAME & ADDRESS**	**PART NUMBER**
N/A	CATapult (Consumer Access Terminal) Rural Mount Design Contest	N/A	N/A	N/A	N/A

REVISIONS				
ZONE	**REV.**	**DESCRIPTION**	**DATE**	**APPROVED**
N/A	-	INITIAL RELEASE	SEE TITLE BLOCK	SEE TITLE BLOCK

Notes
1. This drawing is the sole authority for hardware form, dimension, and interface definition. In general, information contained in this drawing is preliminary and may be modified with OneWeb approval.
2. Area represents the minimum terminal engagement area.
3. Unit mass shall be minimized



INTERFACE SOLID MODEL
CATapult Antenna



INTERFACE SOLID MODEL
CATapult Clamp

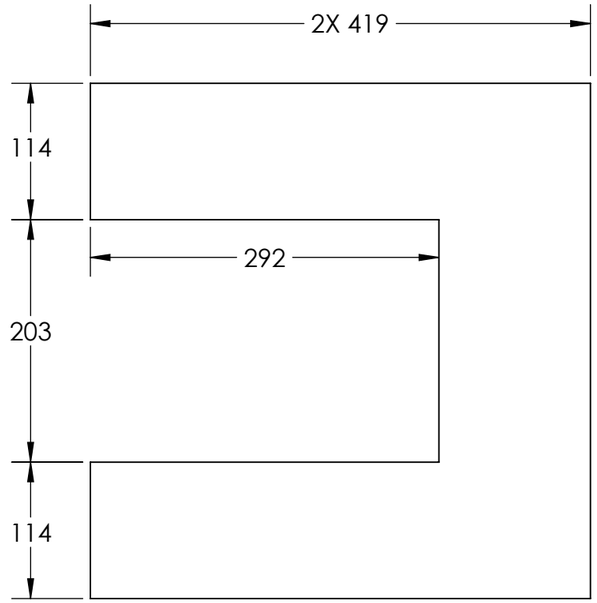
			NAME	DATE
	UNLESS OTHERWISE SPECIFIED:	DRAFTER	J. Wallace	04/12/2016
	DIMENSIONS ARE IN MM TOLERANCES: ANGLE: ±0.1 NO DECIMAL:± 1 ONE PLACE DECIMAL: ±0.1 TWO PLACE DECIMAL: ±0.01	ENGINEER		
		MANAGER		
		THERMAL		
		STRUCTURAL		
		MANF.		
	INTERPRET GEOMETRIC TOLERANCING PER: ASME Y14.5 2009	AIT		
		QUALITY		
		APPROVER	N/A	N/A

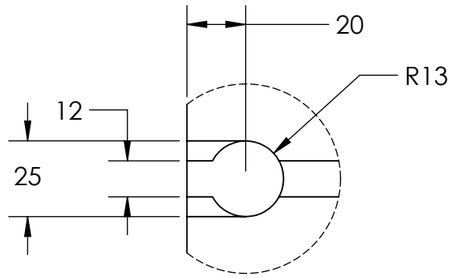
TITLE:
INTERFACE SOLID MODEL
CATapult (Consumer Access Termial) Rural Mount

SIZE	DWG. NO.	REV
B		

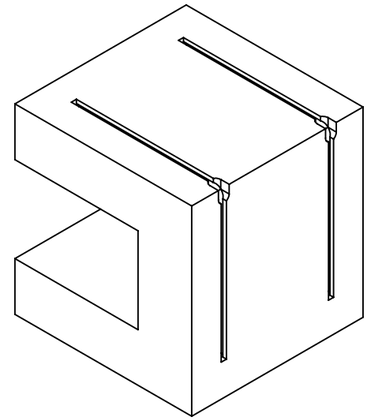
SCALE: 1:6		SHEET 1 OF 3

DO NOT SCALE DRAWING

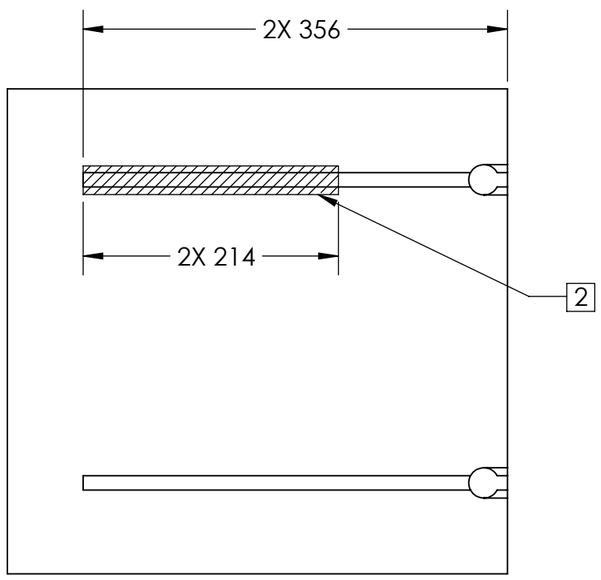


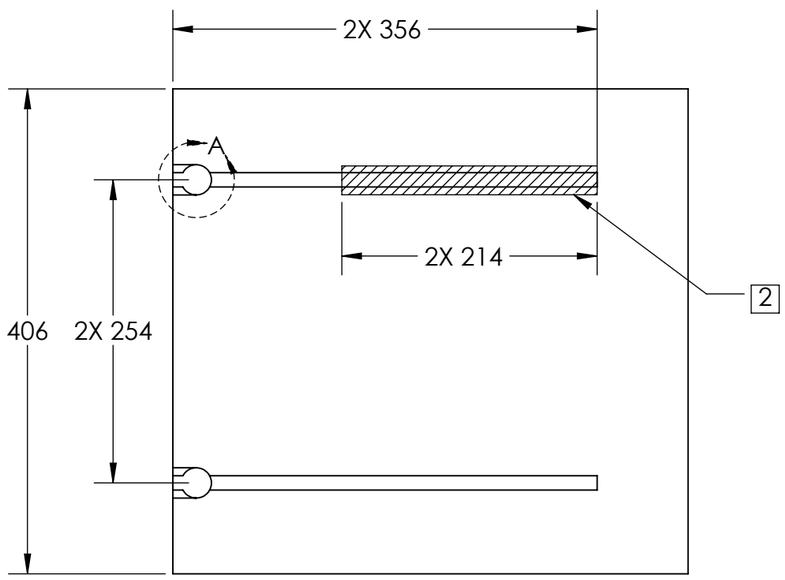


DETAIL A
SCALE 1 : 2
4 PLACES



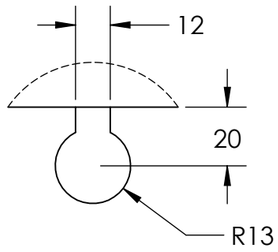
ISO VIEW
CATapult Clamp
SCALE 1:10



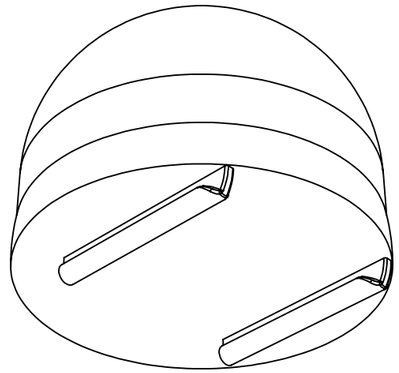


INTERFACE SOLID MODEL
CATapult Clamp

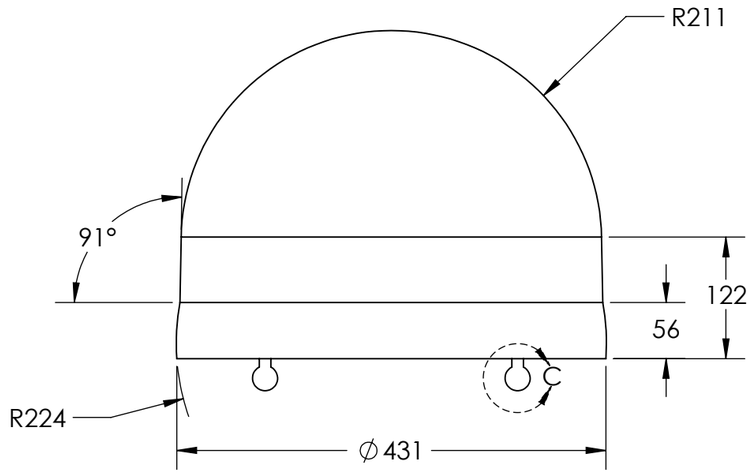
SIZE	DWG. NO.	REV
B		
SCALE: 1:5		SHEET 2 OF 3

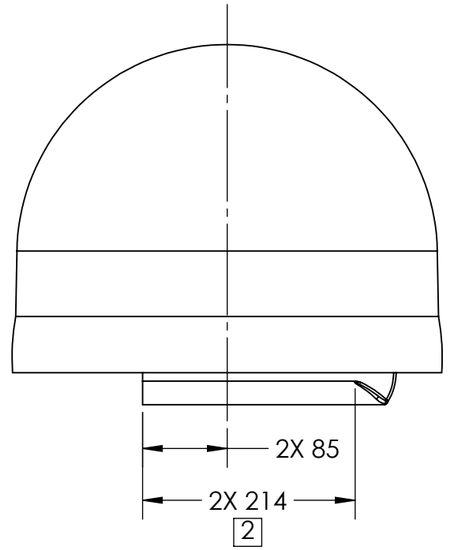


DETAIL C
SCALE 1 : 2
2 PLACES



ISO VIEW
CATapult Clamp





INTERFACE SOLID MODEL
CATapult Antenna

SIZE	DWG. NO.	REV
B		
SCALE: 1:6		SHEET 3 OF 3