= Bolliger & Mabillard =

Bolliger & Mabillard , abbreviated B & M and formally known as Bolliger & Mabillard Consulting Engineers Inc . , is a roller coaster design consultancy based in Monthey , Switzerland . The company was founded in 1988 by Walter Bolliger and Claude Mabillard , with Bolliger as president and Mabillard as vice @-@ president . Since 1988 , B & M has built 100 roller coasters around the world and have pioneered several new ride technologies , most notably the inverted roller coaster . Since 1990 , all coasters designed by B & M that have been built within North America have been manufactured by Clermont Steel Fabricators which is located in Batavia , Ohio , United States . B & M started with four employees and has since grown ; as of 2012 it employs 37 people , mostly engineers and draftsmen . In 2016 the company completed its 100th coaster .

= = History = =

Walter Bolliger and Claude Mabillard starting working for Giovanola , a manufacturing company who supplied rides to Intamin , in the 1970s . During their time at Giovanola , they helped design the company 's first stand @-@ up roller coaster , Shockwave at Six Flags Magic Mountain . They also worked on other projects , such as Z @-@ Force at Six Flags Great America . Bolliger & Mabillard left Giovanola , but the company continued to use their track design , so the company 's roller coasters , Goliath at Six Flags Magic Mountain and Titan at Six Flags Over Texas , use a track style very similar to B & M 's .

In 1987 , Giovanola underwent a change of management ; Bolliger & Mabillard decided to leave , and founded their own company . At the time , B & M employed four people ; two draftsmen , Bolliger , and Mabillard . When B & M was created , the pair had agreed not to make any more amusement attractions . However , Six Flags contacted the new company and asked it to build a roller coaster . B & M accepted the offer and hired two more draftsmen . But B & M had a problem regarding how and where to manufacture the track pieces for the roller coaster . With the impression of the work done by Clermont Steel Fabricators on Vortex at Kings Island and Shockwave Six Flags Great America , Walter Bolliger went to the steel plant and asked if they would be interested in manufacturing the track . Clermont Steel Fabricators accepted and currently manufactures all Bolliger and Mabillard roller coaster track pieces for all of North America . Now with a company to manufacture the track , B & M built its first roller coaster , a stand @-@ up roller coaster , Iron Wolf , which opened in 1990 at Six Flags Great America . Two years later , Bolliger & Mabillard built another project for Six Flags Great America , Batman : The Ride , the world 's first Inverted Coaster , which brought them to prominence in the industry .

Bolliger & Mabillard also invented the Floorless Coaster , and the Dive Coaster . The company also built its first launched roller coaster , the The Incredible Hulk , which is at Universal 's Islands of Adventure . Although The Incredible Hulk uses a launch system , B & M classifies it as a " Sitting Coaster " . In 2010 , B & M unveiled its new Wing Coaster and premiered the prototype model , named Raptor , at Gardaland in 2011 . It has two seats on each side on the car that hang riders over the sides of the track . There are currently only five in operation . In 2015 , B & M constructed Thunderbird at Holiday World & Splashin ' Safari , its first in @-@ house launched coaster .

By 2010 , B & M employed twelve engineers , twelve draftsman , and two draftswomen . The company has made other contributions to the roller coaster industry . The company built the trains for the Psyclone , a now @-@ demolished wooden roller coaster at Six Flags Magic Mountain . The trains were later used on the park 's Colossus wooden roller coaster (until it was refurbished by Rocky Mountain Construction) , but were only used during October each year . The trains faced backward and usually raced against trains on the second track , which ran forward . In 2013 , B & M supplied new trains for Steel Dragon 2000 , built by D. H. Morgan Manufacturing in 2000 . As of 2012 , Bolliger & Mabillard has 85 operating roller coasters worldwide , twenty @-@ two of which are listed among the Amusement Today Golden Ticket Awards Top 50 Steel Coasters List for 2012 , and five are in the top 10 . The company has built more roller coasters than any other manufacturer on the list .

= = Features = =

Bolliger & Mabillard currently manufactures nine different roller coaster styles : Stand @-@ Up Coaster , Inverted Coaster , Floorless Coaster , Flying Coaster , Hyper Coaster , Dive Coaster , Sitting Coaster , Wing Coaster and Family Coaster . Bolliger & Mabillard has been involved in developing new technologies and concepts in roller coasters almost since its inception . It has often worked with engineer Werner Stengel , and with designers and management of client theme parks .

= = = Lift hills = = =

Many Bolliger & Mabillard coasters feature an element known as a " pre @-@ drop " , a short drop after the top of the lift hill and before the start of the first drop , designed to reduce tension on the lift chain . The flat section between the pre @-@ drop and the first drop serves as a shelf to support the weight of the train , reducing related stresses on the chain . On most coasters without a pre @-@ drop , the weight of the train tends to pull on the lift chain as it begins its descent because the latter half of the train is still being lifted by the chain . Pre @-@ drops have not been used on the company 's Dive or Flying coasters , or on hyper coasters built after 1999 . More recently , the pre @-@ drop is only used on coasters with curved drops , whereas coasters with straight drops ? such as Hydra the Revenge at Dorney Park & Wildwater Kingdom and Goliath at Six Flags Over Georgia ? do not have pre @-@ drops . OzIris at Parc Astérix was the first B & M inverted roller coaster that does not feature a pre @-@ drop .

= = = Trains = = =

Most of Bolliger & Mabillard 's roller coaster trains use four @-@ abreast seating . Each car has one row of four seats , while the train length can vary between coasters . All of the company 's coaster models , except the Dive Coaster and Wing Coaster use this configuration . The Dive Coaster uses six , eight or ten @-@ abreast seating , with two or three rows of seats . For example , Griffon at Busch Gardens Williamsburg , uses ten seats in three rows , while Krake at Heide Park uses six @-@ across seating in three rows . On recent hyper coaster projects , B & M has used a new car design that has two rows of two seats ; the two seats in the rear of the car pushed out from the centerline so that the four seats resemble a V formation . This formation has only been used on Behemoth at Canada 's Wonderland , Diamondback at Kings Island , Intimidator at Carowinds and Shambhala : Expedición al Himalaya at PortAventura . In 2013 , B & M introduced a new car design that has two rows of two seats , however , they are not in a V formation .

All B & M hyper coasters use a type of restraint called a " T @-@ bar " restraint , which consists of bar with a cushioned lap bar with two handles for riders to hold on to . This type of restraint generally does not use a seat belt , however seat belts have been added to Behemoth at Canada 's Wonderland , Diamondback at Kings Island , and Intimidator at Carowinds , all of which have the stadium style seating . Bolliger & Mabillard also uses over @-@ the @-@ shoulder restraints , in that the restraint is placed over the riders ' shoulders and sits and extends to the riders ' laps . This type of restraint is used on Dive , Inverted , Sitting , Flying , Floorless , Stand @-@ up , and Wing Coasters .

= = = Track = = =

A notable feature of Bolliger & Mabillard roller coasters is the box @-@ section track . The running rails are connected to a box @-@ section spine , instead of the circular spine used by other manufacturers . When a train travels around a box @-@ section track , it creates a distinctive roaring sound , which is unique to this style of track . However , on some Bolliger & Mabillard roller coasters , such as Talon at Dorney Park & Wildwater Kingdom , the track is filled with sand to reduce this noise .

Also , depending on the model of the roller coaster , the track size can vary . Models such as the Flying , Wing , and Dive Coaster have heavier trains which require a larger track size while models with lighter trains , such as the Stand @-@ Up and Hyper Coaster , do not and use a smaller sized track .

= = = Brakes = = =

As of 2016 , Bolliger & Mabillard uses three types of braking system ; friction , magnetic , and water .

= = = = Friction brakes = = = =

When B & M was first founded , the linear magnetic eddy brake had yet to be developed , so it used friction brakes as its main braking system . On the train , pads are fitted beneath the seating areas . On the brakes , similar pads are connected to steel supports . When the pads on the train come into contact with the brakes , friction is created which slows the train . Beginning with Kumba in 1993 , friction brakes have also been used as trim brakes that regulate the speed of the train while it is still navigating the course .

= = = = Magnetic brakes = = = =

Magnetic brakes were first used on Nitro at Six Flags Great Adventure in 2001 . Magnetic brakes slow down trains much faster than friction brakes ; most B & M roller coaster built in or after 2001 have at least one set of magnetic brakes . Magnetic brakes do not make contact with the train . Fins that run parallel to the train are fitted beneath the seats . As the fins pass through the brakes , the magnetic field created by the brakes slows the train . Magnetic brakes have also been used as an alternate type of trim brake on B & M roller coasters such as Leviathan at Canada 's Wonderland .

= = = = Water brakes = = = =

Water brakes were first introduced on SheiKra at Busch Gardens Tampa Bay in 2005 . Water brakes can only be used when a splashdown element , in which a body of water surrounds a section of track , is present within the layout of the roller coaster . When scoops on the last car of each train come in contact with the surrounding water , the train slows down and the water is sprayed several feet into the air behind it .

= = List of roller coasters = =

Bolliger & Mabillard has built over 100 roller coasters as of 2015 . All are still in operation , except the original Incredible Hulk which was dismantled in 2015 and completely replaced in 2016 . Some have been relocated and renamed .