BAB II
TINJAUAN PUSTAKA

2.1 Musik

2.1.1 Definisi

Menurut (Jamalus 1988) p.1 Musik merupakan suatu hasil karya seni berupa bunyi dalam bentuk lagu dan komposisi yang mengungkapkan pikiran dan perasaan penciptanya melalui unsur-unsur pokok musik yaitu irama, melodi, harmoni dan bentuk atau struktur lagu serta ekspresi sebagai suatu kesatuan[2].

2.1.2 Sejarah

Menurut (Smithsonian 2013) p.11 *The earliest musical instrument is one still used today— the human body. The drum, bone flute, and harp were the earliest musical tools fashioned by humans. Whether in the form of singing, clapping, or rhythmic pounding, music has always been used to celebrate, praise, express sorrow and joy, to rally the troops or terrify the enemy[3].* Instrumen musik era awal masih dipergunakan hingga hari ini, yaitu tubuh manusia. Genderang, suling tulang, dan harpa, merupakan instrumen musik era awal yang didesain oleh manusia. Dalam bentuk bernyanyi, bertepuk tangan, atau menepukkan ritme, musik selalu dipergunakan untuk merayakan, memuji, mengexpresikan kesedihan maupun kegembiraan, dan untuk menyemangati pasukan maupun menakuti musuh.

Menurut (Smithsonian 2013) p.4-6, sejarah musik dapat diklasifikasikan menjadi 8 era yaitu [4]:

A. *Early Beginnings, 60.000 bce – 500 ce*
B. *Music in The Middle Ages, 500 – 1400*
C. *Renaissance and Information, 1400 – 1600*
D. *The Baroque Spirit, 1600 – 1750*

2 Jamalus. 1988. Panduan Pengajaran Buku Pengajaran Musik melalui Pengalaman Musik. Jakarta: Proyek Pengembangan Lembaga Pendidikan . p.1
3 Smithsonian. 2013. Music - The Definitive Visual History. New York: DK Publishing. p.11
4 Smithsonian. 2013. Music - The Definitive Visual History. New York: DK Publishing. p.4-6

E. *The Classical Age, 1750 – 1820*

F. *Nationalism and Romance, 1820 – 1910*

G. *Music in The modern Age, 1910 – 1945*

H. *Global Music, 1945 – present*

2.1.3 Perkembangan

Menurut (Smithsonian 2013) p.263 *after World War II, the United States captivated the world with the swaggering confidence of its popular music. Jazz, blues, and rock'n'roll combined with radio television, and hollywood movies to capture a global audience. Orchestral music and opera continued to evolve in a dizzyingly diverse number of styles, and "world" music gave a voice to the music of every country on earth*[5]*.* Setelah perang dunia kedua, Amerika Serikat menarik perhatian dunia musik dengan kepercayaan diri dan keangkuhan mereka terhadap musik populer. Jazz, blues, rock'n'roll yang dikombinasikan dengan radio, televisi, film hollywood, mulai menangkap perhatian pemirsa global. Musik orkestra dan opera melanjutkan berevolusi dengan bermacam-macam gaya dan musik "dunia" memberikan suara terhadap musik dari berbagai negara di dunia.

Menurut (Smithsonian 2013) p.265 *The postwar period produced classical, jazz, and popular music that challenged the notion of what music actually was. Some modern classical composers and jazz artists explored ever more intricate tonality and lyricism; others jettisoned traditional musical values in pursuit of the new and provocative. Rock'n'roll linked youth-oriented popular music to an insubordinate subculture that alienated the older generation—as did punk and hip-hop. The broad notion of "mainstream" and "alternative" music appeared as popular music fragmented into a diverse array of subgenres, while technology transformed the way music was produced, distributed, and consumed*. Era setelah perang menghasilkan klasik, jazz, dan musik populer yang menantang untuk menghasilkan gagasan pada apa musik yang sebenarnya. Beberapa komposer klasik modern dan artis jazz

5 Smithsonian. 2013. Music - The Definitive Visual History. New York: DK Publishing. p.263

mengexplorasi *tone* yang lebih rumit, nilai-nilai musik tradisional yang mengejar aspek kontemporer dan provokatif. Rock'n'roll berorientasi pemuda yang melawan subkultur dan mengasingkan generasi pendahulu-seperti punk dan hip hop. Gagasan luas yang *"mainstream"* dan "alternatif" muncul sebagai musik populer yang terbagi dalam beberapa subgenre, sementara teknologi mengubah cara musik diproduksi, didistribusikan, dan dikonsumsi.

Gambar 2. 1 Kurt Cobain, Seorang Punggawa Aliran Musik Grunge
Sumber : http://itcolossal.com/wp-content/uploads2/2013/07/Nirvana/4256-990x646.jpg

Berikut ini merupakan data tabel mengenai perkembangan dari berbagai momen musik pada era *Global Music 1945-present* yang dibatasi hanya pada kondisi dari 1990 - sekarang:

Tabel 2. 1 Perkembangan Momen Musik pada Era *Global Music*

Era	Keterangan
1990	1991 – Nirvana merilis Nevermind yang mempopulerkan grunge. 1993 – Arvo part merekam "Te Deum" di Estonia, mendapatkan pengaruh di "holy minimalism" 1994 – MP3 muncul di internet, mengkompres sejumlah besar data audio pada format digital untuk siaran langsung musik dan penyimpanan.
1995	1995 – HIStory dari Michael Jackson menjadi best-selling album dobel sepanjang masa. Band rock US Grateful Dead memainkan pertunjukan terakhir mereka.

	1996 – Debut dari The Spice Girl “Wannabe” dirilis 1999 – Mamma Mia yang merupakan jukebox dari ABBA dibuka di London.
2000	2001 – Toko musik online dari Apple yaitu iTunes dibuka untuk bisnis 2004 – Reality Talent Show yang berpengaruh The X Factor debut di UK TV 2005 – YouTube yang merupakan website pertukaran video diluncurkan 2007 – Film High School Musical pertama dirilis 2008 – Website streaming musik Spotify diluncurkan 2012 – Video dari YouTube untuk Gangnam Styke dari Psy mulai mendunia 2013 – Website milik David Bowie mengejutkan para fans dengan lagu barunya setelah 10 tahun dan diperkenalkan di album pertamanya setelah 20 tahun.

Sumber : Smithsonian. 2013. Music - The Definitive Visual History. New York: DK Publishing. P.264-265. Diolah kembali oleh penulis September 2015

2.2 Instrumen Musik

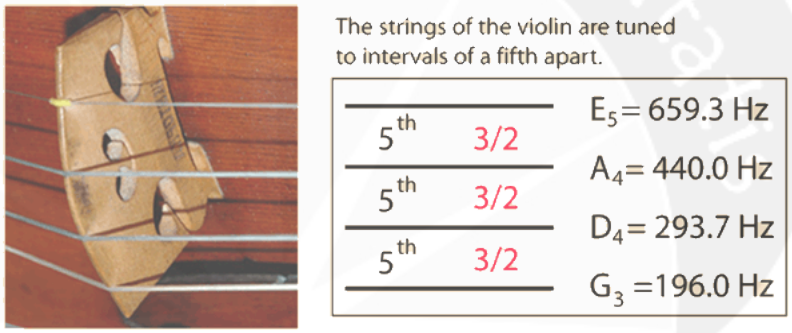
2.2.1 *String Instruments*

A. Violin

Menurut (Nave 2012) *the violin, the most commonly used member of the modern string family, is the highest-sounding instrument of that group. The strings are tuned a fifth apart at G3(196 Hz), D4, A4, E5(659.3 Hz) using the A4 = 440Hz standard. Strings characteristically produce a fundamental resonance plus all the string harmonics. The sound of the instrument is enhanced by body resonances including the air resonance of the f-holes*[6].

[6] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/hbase/hph.

Gambar 2. 2 *Violin* dan *Violin Case*
Sumber : http:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/violin.jpg



Gambar 2. 3 Frekuensi pada Masing-masing Senar Violin
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/muspic/viotun.gif

B. Viola

Menurut (Nave 2012) *the viola is the alto of the violin family, and it has the responsibility of playing the tenor part in the string quartet. Larger and heavier than the violin, it is tuned a fifth lower and has a darker, somewhat nasal tone. The strings are tuned a fifth apart at C3(130.8 Hz), G3, D4, A4(440 Hz). String instruments characteristically produce a fundamental resonance plus all the string harmonics*[7].

[7] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/violin.

Gambar 2. 4 Contoh *Viola*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/viola.jpg

C. *Cello*

Menurut (Nave 2012) *the cello, or violoncello, is the second largest member of the VIOLIN family of musical instruments. It is tuned an octave below the VIOLA and serves both as a melodic and bass instrument in chamber and orchestral music. The body of the cello is approximately 76 cm (30 in) long and is much deeper than those of the violin and viola. The cellist is seated and supports the instrument between his calves, with its lower end raised off the floor by an endpin. The strings are tuned a fifth apart at C2(65.4 Hz), G2(98 Hz), D3(146.8 Hz), A3(220 Hz) if tuned in equal temperament to the A4(440 Hz) standard*[8].

Gambar 2. 5 Contoh *Cello*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/cello.jpg

[8] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/cello

D. Contra Bass

Menurut (Nave 2012) *the double bass, also called bass viol or contrabass, is the largest and lowest-pitched member of the orchestral string section. The standard double bass has four strings and a range from E just over an octave below the bass staff, upwards for nearly three octaves, although some instruments may have five strings in order to extend the range downward. The strings are tuned a fourth apart at E1(41.2 Hz), A1, D2, G2(98 Hz). For the double bass, the string tensions of the four strings are essentially equal, implying that the mass per unit length of the strings must be adjusted close to 9/16 ratios for successive strings. This is to achieve the musical fourth 4/3 pitch intervals since the string frequency is proportional to the inverse square root of the mass per unit length. Tables of string tension show tensions in the range 60 to 80 lbs for different compositions and manufacturers, but in all cases the tensions for the four strings are about the same. This is in contrast to the other members of the classical string family for which the tensions in the lowest pitch strings are significantly higher*[9].

Gambar 2. 6 *Contoh Contrabass*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/bass.jpg

Bridge pada instrumen *contrabass* memindahkan getaran dari senar menuju *plate* di bagian atas instrumen. *Bridge* dilengkapi dengan *piezoelectric* untuk memproduksi output elektrik yang dapat diamplifikasikan.

[9] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/contra-bass

Gambar 2. 7 *Piezoelectric* pada *Bridge Contrabass*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/muspic/7bassbridge.jpg

E. Gitar

Menurut (Nave 2012) *guitar refers to hollow-bodied guitars without electric amplification. They may have nylon or steel strings. The strings of a six-string guitar are tuned to E, A, D, G, B, E, a fourth apart except for the major third interval between B and G. Frets are placed by the fret rule "one-eighteenth the remaining length of the string". This makes them a semitone apart*[10].

Gambar 2. 8 Contoh Gitar Akustik
Sumber : http:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/acoguit.jpg

2.2.2 *Woodwind Instruments*

A. *Flute*

Menurut (Nave 2012) *the flute is made in the form of an open cylindrical air column about 66 cm long. Its fundamental pitch is middle C*

[10] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/acoustic-guitar.

(C4) and it has a range of about three octaves to C7. Sound is produced from a flute by blowing onto a sharp edge, causing air enclosed in a tube to vibrate. The flute as shown above is a transverse or side-blown flute[11].

Gambar 2. 9 Orang Memainkan *Flute*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/muspic/saraflute.jpg

B. *Piccolo*

Menurut (Nave 2012) *the piccolo, a transverse flute pitched an octave above the concert or standard flute, is a development of the late 18th century. It is about 33 cm long and plays from D5 to B7-flat. Its range is nearly three octaves, reaching the highest pitches in the modern orchestra. It has a bright sound that can be heard easily, even in thickly scored orchestral passages*[12].

Gambar 2. 10 Contoh *Piccolo*
Sumber : https://hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/piccolo.jpg

C. *Clarinet*

Menurut (Nave 2012) *the clarinet consists of a closed cylindrical air column with a bell-shaped opening at one end. It's mouthpiece holds a single reed, in contrast to the double reed of the oboe family. It is typically constructed of wood. The traditional wood is an ebony*

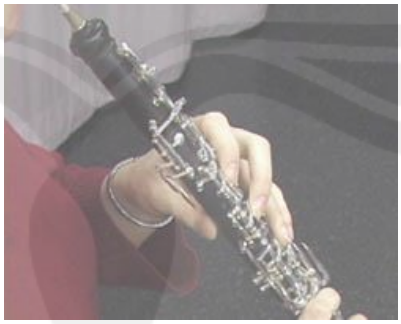
[11] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/hbase/hph.
[12] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/picollo

from Africa, Asia or South America commonly referred to as grenadilla wood. Hard and black, this wood is capable of taking a high polish. The instrument most commonly used today is known as the B-flat clarinet; the next most common is the clarinet in A. The B-flat clarinet is about 60 cm (23.6 in) long and has a range of more than three octaves[13].

Gambar 2. 11 Contoh *Clarinet*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/clarinet.jpg

D. Oboe

Menurut (Nave 2012) *the oboe is a soprano-range, double-reed woodwind instrument of length 62 cm. Its wooden tube is distinguished by a conical bore expanding at the end into a flaring bell. The modern oboe's range extends from the B-flat below middle C (B3-flat) to the A nearly three octaves higher (A6). Sounding a fifth below the oboe is the English horn and the bass member of this family is the bassoon*[14].



Gambar 2. 12 Contoh Cara Memegang Oboe
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/muspic/lizob4.jpg

[13] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/clarinet
[14] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/oboe

E. Saxophone

Menurut (Nave 2012) *the soprano saxophone is 40 cm long and has a range of about 2 1/2 octaves, from A3-flat to E6-flat. The alto sax covers D3 to A5-flat. The family of saxophones patented in 1846 by Adolphe Sax combines the single reed of the clarinet with the bore and fingering patterns of the oboe, producing the tonal qualities of neither. Saxophones are made in eight sizes and pitch levels, spanning the entire spectrum of wind-instrument pitches. The most common are the alto and tenor saxophones. They have been effectively used in jazz bands and popular dance orchestras*[15].

Gambar 2. 13 Contoh *Saxophone*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/saxophone.jpg

F. Bassoon

Menurut (Nave 2012) *the bassoon is a double-reed woodwind instrument with a conical bore air column, the bass member of the oboe family. Its normal range is about 3 octaves, from B1flat to E5flat. The tube, 2.79 m (9 ft 2 in) long, is bent to make a height of 1.22 m (4 ft) and consists of a metal crook on which the reed is placed and four sections of maple or pearwood: the tenor, the butt, the bass, and the bell*[16].

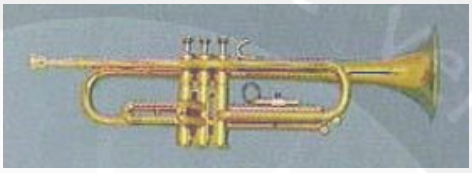
Gambar 2. 14 Contoh *Bassoon*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/bassoo.jpg

[15] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/saxophone
[16] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/bassoon

2.2.3 *Brass Instruments*

A. Trumpet

Menurut (Nave 2012) *the modern trumpet has three valves and a bore that is partly cylindrical, partly conical. The standard orchestral trumpet, built in B-flat, has a range of about three octaves extending upward from the F-sharp be extending upward from the F-sharp below middle C(F3 sharp = 185 Hz). Models in D, C, and other pitches also exist*[17].



Gambar 2. 15 Contoh *Trumpet*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/trumpet.jpg

B. Tuba

Menurut (Nave 2012) *tuba refers to a family of lip-vibrated, upright, valved, metal wind instruments with a folded tube of wide, conical bore. It was designed to fill an urgent need in brass bands for a satisfactory bass to the valved bugle. Although built in various sizes, only the baritone in B-flat (along with the wider-bored euphonium) and the basses in F, E-flat, CC, and BB-flat survive*[18].

Gambar 2. 16 Contoh Tuba
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/tuba.jpg

[17] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/trumpet
[18] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/tuba

C. *Trombone*

Menurut (Nave 2012) *the trombone emerged as a variation of the medieval trumpet when the slide, in the form of a U-bend, was created (mid-15th century), immediately producing an efficient and unique low brass instrument capable of playing all chromatics. From that time to the present, the instrument has consisted fundamentally of a bell section including attached inner slides, outer slides, and mouthpiece, the tube being cylindrical up to a gradual expansion toward the bell*[19].

Gambar 2. 17 Contoh *Trombone*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/trombone.jpg

D. *Euphonium*

Menurut (Nave 2012) *the euphonium is a member of the tuba family. It has a slightly higher range and more mellow tone*[20].

Gambar 2. 18 Contoh *Euphonium*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/euphon.jpg

[19] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/trombone
[20] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/euphonium

E. French Horn

Menurut (Nave 2012) *at 17 ft the longest of the brass instruments except for the tuba. Piston valves and rotary valves. Hand closure gives half step sharp, but physically it increases the acoustic mass and lowers the resonance. The usual description says that the hand closure makes the note closer to the next mode up so that the column jumps to the next resonance during the hand closure. The first valve lowers the pitch a whole step, the second a half and third a step and a half. The Kruspe double horn has a horn in F and a horn in B, adding about another three feet to the column*[21].

Gambar 2. 19 Contoh *French Horn*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/FrenchHorn.jpg

F. Flugelhorn

Menurut (Nave 2012) *the flugelhorn is a valved bugle developed in Germany. It has a conical bore. The bugle had no valves and therefore could produce only the natural harmonics of the tube. The design pitch was was typically middle C or B-flat. The flugelhorn has a mellower sound than the trumpet*[22].

Gambar 2. 20 Contoh *Flugelhorn*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/flugel.jpg

[21] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/french-horn
[22] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/flugelhorn

2.2.4 *Percussion Instruments*

A. Timpani

Menurut (Nave 2012) *the timpani has a round head stretched over a sealed enclosure. The tension may be altered by means of a footpedal which actuates tensioning elements*[23].

Gambar 2. 21 Contoh *Timpani*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/timpan.jpg

B. Snare Drums

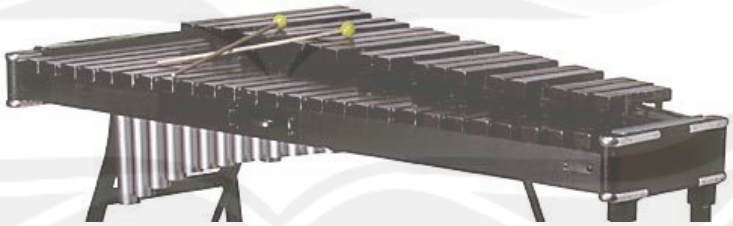
Menurut (Nave 2012) *the snare drum is a two-headed drum, as is the bass drum and other orchestral and band drums used in Western music. On the snare drum, eight to ten wire-bound gut strings, or snares, usually are stretched across the lower of the two heads; they vibrate against the heads as the membranes are struck. The two membranes of the snare drum are acoustically coupled to each other, particularly at the low frequencies. This coupling via the enclosed air acts to double the modes. The lower frequency member of the mode pair involves both heads moving in the same direction and for the higher mode they move oppositely*[24].

[23] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/timpani
[24] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/snare-drums

Gambar 2. 22 Contoh *Snare Drums*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/snaredrum.jpg

C. Marimba

Menurut (Nave 2012) *the playing range of a concert marimba is A2 to C7 (110 to 2093 Hz) and bass marimbas extend down to C2 (65 Hz). The undercutting of the bars on the marimba produce overtones which are described as two octaves up, and then three octaves plus a minor third. Two octaves is the fourth harmonic, and the other overtone is close to the 10th harmonic (48/5 if just intervals are used). These upper resonances are not reinforced by the closed tube resonator since it produces only odd harmonics*[25].



Gambar 2. 23 Contoh *Marimba*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/xyloph.jpg

D. Bells

Menurut (Nave 2012) *some of the commonly used bells are church bells, carillion bells, and handbells. Carillion bells have eight modes of vibration which contribute to the tone. Handbells, struck with a soft internal clapper, have a 2,0 mode which is the strike tone. The 3,0 mode is tuned to three times the frequency of the 2,0 mode and the 2,0 mode*

[25] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/marimba

produces some second harmonic, so you have sound at the first three harmonics. Rossing (p283) shows hologram interferograms of 17 modes of a C5 (523 Hz) handbell[26].

Gambar 2. 24 Contoh *Bell*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/hbell.jpg

E. Lyra Glockenspiel

Menurut (Nave 2012) *the glockenspiel makes use of the free bar modes .They are not a harmonic sequence, but the fundamental mode produces a clear, bell-like tone. Sometimes called "orchestra bells", the glockenspiel has rectangular bars 1 in to 1 1/4 in wide and 5/16 to 3/8 thick. A typical range is G5 (784 Hz) to C8 (4186 Hz), matching the top end of the piano. When played with brass or plastic mallets, a sharp attack is produced followed by a clear, ringing sound at the designed pitch. The upper bar modes, which are not harmonics of the fundamental pitch, die away quickly*[27].

Gambar 2. 25 Contoh *Lyra Glockenspiel*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/glock.jpg

[26] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/bell
[27] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/lyra-glockenspiel

F. Tubular Bells

Menurut (Nave 2012) *a bell-like sound can be obtained by tuned metal tubes. They are commonly referred to as bells or chimes. A similar instrument is constructed of metal bars. The set of hollow vertical pipes is suspended at the top of the pipes by thin wire. Each pipe is struck with hammers on the top part of the chime. The three lowest modes of vibration of a chime tube have frequencies with ratios 2:3:4. The ear perceives this as the pitch one octave below the fundamental by the missing fundamental effect. Other overtones depart from this approximate linear set of harmonics and help give the chime its unique sound. There are end plugs which are said to add to the sustain of the tone and to damp out high harmonics. The end plug helps to lower the frequencies of the first few modes, but has little effect on higher modes*[28].

Gambar 2. 26 Contoh *Tubular Bells*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/tbell.jpg

G. Cymbal

Menurut (Nave 2012) *cymbals produce a dramatic percussive sound when struck; several modes of vibration of the thin metal are excited. Since the vibrational modes of the metal circle are not harmonics, there is a less-definite sense of pitch that that of most orchestral instruments for which the fundamental pitch is reinforced by the missing fundamental effect*[29].

[28] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/tubular-bells
[29] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/cymbal

Gambar 2. 27 Contoh *Cymbal*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/cymbl2.jpg

H. Bass Drum

Menurut (Nave 2012) *the bass drum usually has a diameter of 50-100 cm and membranes on both ends of the cylindrical body. Although the drum does not have a well-defined pitch center, it is common practice to tune the lowest modes of the two heads about a musical fourth apart. The coupling between the two heads of the drum produces a splitting of the two lowest modes, the 0,1 and 1,1 modes*[30].

Gambar 2. 28 Contoh *Bass Drum*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/bdrum.jpg

I. Drum Kit

Menurut (Nave 2012) *a bass drum, snare drum, two toms, two cymbals and one pedal- operated "high-hat" pair of cymbals. The main differences between drums are their dimensions, the wood they are made of, and teh consistency of the bearing edge. The preferred wood is maple, but mahogany and birch are also used*[31].

[30] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/bass-drum
[31] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/drum-kit

Gambar 2. 29 Contoh *Drum Kit*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/drumkit.jpg

2.2.5 *Piano and Others*

A. Piano

Menurut (Nave 2012) *this baby grand is one of several configurations of the piano. The piano has 88 keys which span the frequency range 27.5 Hz (A0) to 4186 Hz (C8). The strings are sounded by hammer mechanisms which are activated by the keys. The relatively soft hammer structure, fashioned from pressurized wool, gives a dramatic attack to the tone without sounding harsh*[32].

Gambar 2. 30 Contoh *Piano*
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/piano.jpg

[32] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/piano

B. Harpsichord

Menurut (Nave 2012) *a stringed keyboard instrument developed during the 14th and 15th century, the harpsichord was widely used until the early 19th century when it was superseded by the piano. 20th century revivals of the instrument feature music of the 16th to 18th centuries with particular emphasis on Bach's music. The metal strings are sounded by plucking with a small piece of material called a plectrum which is attached to the key mechanism. A downward stroke on the key raises the plectrum on the other end so that it plucks the string and then pivots so that it does not touch the string on the way down*[33].

Gambar 2. 31 Contoh Harpsichord
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/harpsi.jpg

C. Organ

Menurut (Nave 2012) *the traditional pipe organ is a collection of tuned pipes which are sounded by admitting air to them from a windchest. The centuries of development of the pipe organ have yielded a rich variation in types of pipes as well as mechanisms for sounding them. The collection of pipes of a given type is called a rank, and the organist's control knob for a rank is called a "stop". "Pulling the stop" means opening the valve to let air into that rank of pipes (when the corresponding key on the keyboard is pressed). Some of the largest organs have more than a hundred ranks*[34].

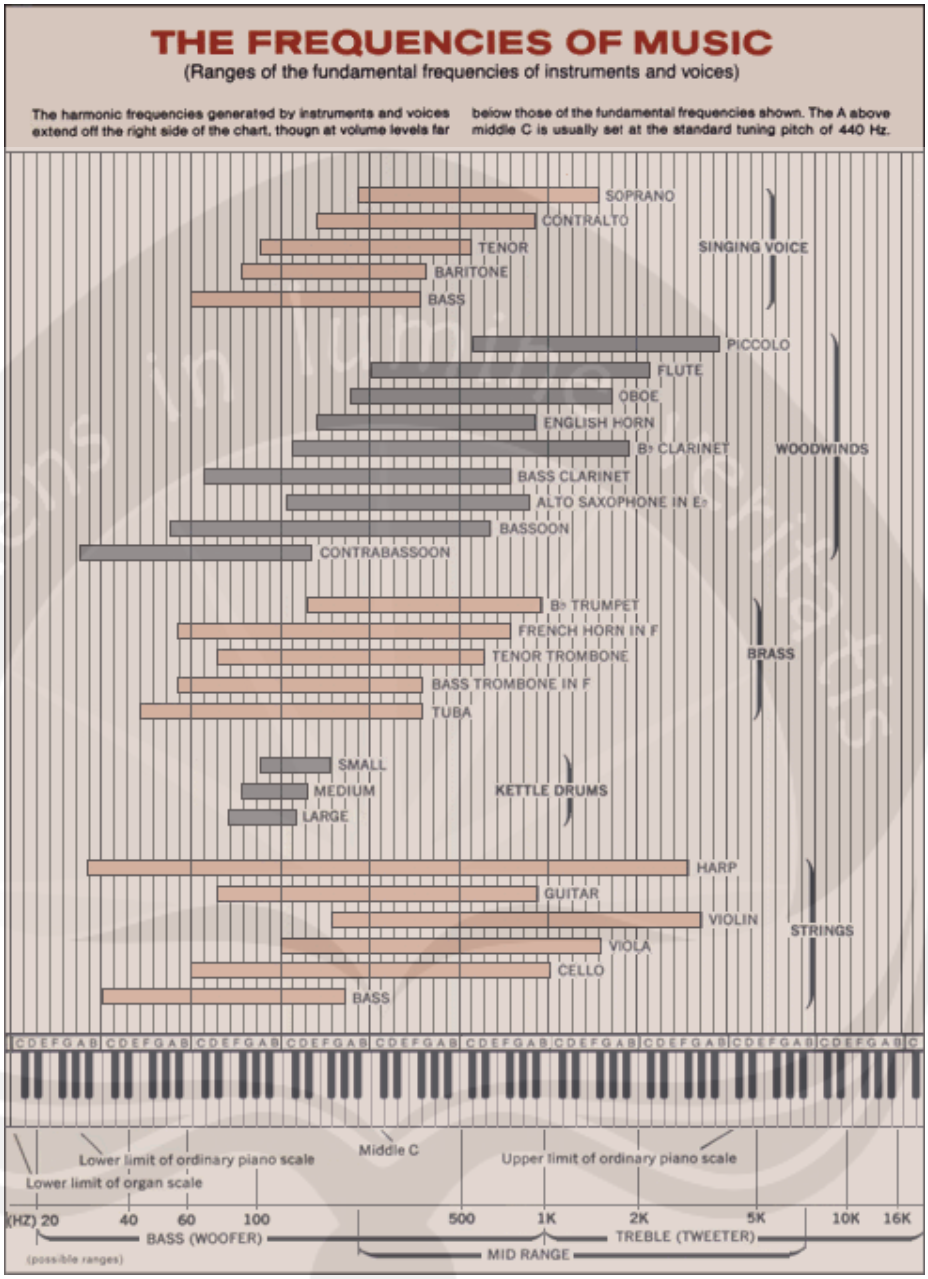
[33] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/harpsichord
[34] Nave, Carl Rod. 2012. HyperPhysics. Diakses Oktober 2, 2015. hyperphysics.phy-astr.gsu.edu/organ

Gambar 2. 32 Contoh Organ
Sumber : https:// hyperphysics.phy-astr.gsu.edu/hbase/music/imgmus/organ.jpg

2.2.6 Intensitas dan Frekuensi Instrumen Musik

Setiap instrumen musik memiliki intensitas dan frekuensi tersendiri. Frekuensi dari masing-masing instrumen musik didasarkan pada rentang dari *pitch* yang dimiliki. Instrumen musik saat ini yang memiliki rentang frekuensi paling jauh adalah piano yang memiliki 88 nada dan terbagi dari 30Hz hingga 4kHz dalam solmisasi A0 hingga C8. Piano sendiri merupakan perkembangan dari harpsichord dan clavichord yang memilik rentang frekuensi lebih kecil sebesar 61 nada dan terbagi dari 120 Hz hingga 2kHz dalam solmisasi C2 hingga C7. Pada zaman renaissance ketika opera mulai dimainkan instrumen musik pada era itu menyesuaikan frekuensi dari harpsichord sehingga kebanyakan dari instrumen string, woodwind, brass, dan percussion memiliki rentang nada sebanyak 2-3 oktaf dan berada pada kisaran rentang nada harpsichord.

Untuk paduan suara atau yang biasa disebut choir sendiri terbagi dari C2 hingga F6 dalam klasifikasi karakter suara dari suara tenor baritone bass pada pria dan sopran mezzosopran alto pada wanita.



Gambar 2. 33 Rentang Frekuensi pada Instrumen Musik
Sumber : http://www.music-academy.net/instruments-frequencies/img0024.jpg

Intensitas yang dimiliki oleh tiap instrumen musik mengharuskan setiap orkestra memiliki kemampuan untuk mengontrol kapabilitas setiap instrumen musik yang dimiliki sehingga tidak memproduksi nois yang berlebih. Berikut ini merupakan tabel yang mengindikasikan intensitas dari masing-masing instrumen :

Tabel 2. 2 Intensitas Instrumen Musik

SOURCE	dB	Peak
Single musicians		
Violin/viola (near left ear)	85 - 105	116
Violin/viola	80 - 90 *	104
Cello	80 - 104 *	112
Acoustic bass	70 - 94 *	98
Clarinet	68 - 82 *	112
Oboe	74 - 102 *	116
Saxophone	75 - 110 *	113
Flute	92 - 105 *	109
Flute (near right ear)	98 - 114	118
Piccolo	96 - 112 *	120
Piccolo (near right ear)	102 - 118*	126
French horn	92 - 104 *	107
Trombone	90 - 106 *	109
Trumpet	88 - 108 *	113
Harp	90	111
Timpani and bass drum	74 - 94 *	106
Percussion (high-hat near left ear)	68 - 94	125
Percussion	90 - 105	123-134
Singer	70 - 85 *	94
Soprano	105 - 110	118
Choir	86	No data
Normal piano practice	60 - 90 *	105
Loud piano	70 - 105 *	110
Keyboards (electric)	60 - 110 *	118
Several musicians		
Chamber music (classical)	70 - 92 *	99
Symphonic music	86 - 102 *	120 - 137
* at 3 m		

Sumber : http://www.soundadvice.info/thewholestory/san12/ , diolah kembali oleh penulis November 2015

Selain pengontrolan intensitas dari masing-masing instrumen sendiri sebenarnya kondisi nois yang dihasilkan juga mampu merusak tubuh ketika terlalu banyak diterima. Terdapat batasan khusus mengenai

jumlah waktu maksimal yang dapat ditoleransi sebelum intensitas dari instrumen musik mempengaruhi kesehatan. Berikut ini merupakan data tabel mengenai batasan waktu yang dapat ditoleransi untuk setiap nois pada beberapa tingkat desibel :

Tabel 2. 3 Batas Waktu Toleransi Nois Instrumen Musik

dB		
82	16 hours	eg violin
85	8 hours	eg harp
88	4 hours	eg trumpet
91	2 hours	eg trombone/French horn
94	1 hour	eg loud piano
97	30 minutes	eg loud soprano
100	15 minutes	
103	7.5 minutes	
137 dB (peak)	Maximum instantaneous peak noise when wearing hearing protection	Note that the peak noise from percussion, e.g. snare drum or cymbal clash, may exceed the 137 dB upper exposure action value.

Sumber : http://www.soundadvice.info/thewholestory/san12/ , diolah kembali oleh penulis November 2015

Berdasarkan data di atas instrumen musik sendiri memiliki intensitas yang berbeda dan frekuensi yang berbeda. Kondisi perbedaan tersebut mempengaruhi akumulasi kemampuan manusia agar tetap berada dalam kondisi prima saat memainkan instrumen musik. Ketika instrumen musik dimainkan dalam ruangan yang akomodatif terhadap intensitas dan frekuensi yang sesuai maka hasil musikal dari tiap instrumen akan berada pada kondisi tepat sasaran. Berikut ini data tabel mengenai klasifikasi instrumen musik berdasarkan intensitas dan frekuensi :

Tabel 2. 4 Klasifikasi Instrumen Musik berdasarkan Intensitas dan Frekuensi

Intensitas Tinggi Frekuensi Tinggi	Intensitas Tinggi Frekuensi Rendah	Intensitas Rendah Frekuensi Tinggi	Intensitas Rendah Frekuensi Rendah
euphonium	trumpet	flute	bassoons
flugelhorn	trombone	piccolo	cello
french horn	tuba	clarinet	viola
saxophone	contrabass	oboe	
marimba	timpani	violin	
cymbal	snare drums		
lyra glockenspiel	organ		
tubular bells			
piano			
harpsichord			

Sumber : Analisis Penulis, November 2015

2.3 Amphitheater

2.3.1 Definisi

Menurut (Paramita 2013) p.1 Ruang Konser dapat berarti ruang di mana tempat konser musik berlangsung seperti musik orkestra, gamelan, paduan suara, angklung, band, music barat dan music tradisional lainnya[35]. Pada efektifitasnya sebagai bangunan, bangunan konser merupakan bangunan yang tidak hanya mempertunjukan musik tapi juga bangunan yang memerlukan pertimbangan mengenai musisi, teknisi, manajemen, yang diintegrasikan dalam bangunan baik secara internal maupun eksternal.

35 Paramita, Anisa Galuh Mayang. 2013. "Jurnal Teknik POMITS." Concert Hall dan Studio Musik dengan Nilai Kekhasan Jawa Timur 2337-3539.

Gambar 2. 34 Ruang Konser pada Red Rock Amphitheater
Sumber : https://blogs.chapman.edu/wp-content/uploads/sites/26/2013/12/britfloyd-765x510.jpg

Berdasarkan sifatnya bangunan konser dapat dipisah menjadi 2 sistem yaitu ruang tertutup dan ruang terbuka. Bangunan konser pada ruang tertutup merupakan bangunan konser dengan format auditorium di mana ruangan tertutup secara keseluruhan menggunakan material khusus. Contoh bangunan konser dengan sistem ruang tertutup adalah Walt Disney Concert Hall. Bangunan konser pada ruang terbuka merupakan bangunan konser dengan format amphiteater di mana ruang konser merupakan ruang terbuka dengan panggung dan area tempat duduk solid dan biasanya dari material alami. Contoh bangunan konser dengan sistem terbuka adalah Amphiteater Taman Budaya Yogyakarta.

2.3.2 Fungsi

Amphitheater menampilkan kegiatan pertunjukan musik sehingga fungsi dari amphitheater merupakan media pengungkapan musik terhadap masyarakat. Sebagai bagian dari kesenian musik memiliki fungsi sosial yang secara universal dapat ditemukan dalam berbagai seni budaya yang terdapat di dunia. Berikut ini merupakan fungsi pertunjukan musik menurut (Merriam 1964) p.300 [36]:

A. *The function of emotional* (Fungsi pengungkapan emosional)

36 Merriam, Allan P. 1964. The Anthropology of Music . Illinois: Northwestern University Press. p.300

B. *The function of aesthetics enjoyment* (Fungsi kenikmatan estetis)
C. *The function of entertainment* (Fungsi hiburan)
D. *The function of communication* (Fungsi komunikasi)
E. *The function of symbolic representation* (Fungsi pengungkapan simbolis)
F. *The function of physical response* (Fungsi respon fisik)
G. *The function of enforcing conformity to social norm* (Fungsi penguatan konformitas terhadap norma-norma sosial)
H. *The function of validation of social institutions and religious vital* (Fungsi validasi tentang institusi sosial dan ritual keagamaan)
I. *The function of contribution to the continuity and stability of culture* (Fungsi kontribusi terhadap kontinuitas dan stabilitas dari kebudayaan)
J. *The function of contribution to the integration of society* (Fungsi kontribusi pada integrasi dalam masyarakat)

Dengan tercapainya fungsi dari pertunjukan musik dalam suatu amphitheater maka amphitheater tersebut secara tidak langsung menjalankan berbagai fungsi dari pertunjukan musik.

2.3.3 Ciri-ciri Khas

Untuk amphitheater modern memiliki ciri-ciri khas sebagai berikut :

A. Berbentuk setengah lingkaran

   Bentuk amphiteater modern yang berpola setengah lingkaran merupakan hasil adaptasi dari kondisi masyarakat. Sistem audio dan efektivitas area penglihatan performer membuat sistem panggung lingkaran pada era modern menjadi tidak efektif.

B. Memilki tempat duduk bertingkat

   Tempat duduk pada amphiteater modern tidak begitu jauh berbeda dengan tempat duduk pada amphiteater kuno

C. Tempat duduk terletak di satu sisi

Peletakan tempat duduk pada satu sisi saja disebabkan oleh efektivitas area penglihatan performer yang tidak mampu menjangkau 360^0 pada satu waktu.

Berikut ini merupakan contoh dari amphitheater modern yang digunakan untuk konser :

Gambar 2. 35 Vetter Stone Amphitheater
Sumber : http://visitgreatermankato.com/wp-content/uploads/2013/11/60-Outdoor-concert-Riverfront-Park.jpg

2.3.4 Fasilitas

Menurut (Chiarra 1983) p.377-378 terdapat 6 fasilitas utama yang wajib diakomodasi pada amphitheater yaitu [37]:

A. *Outside The Theater*

Merupakan area yang terdiri dari tempat parkir, tempat pembelian tiket, ruang kesehatan, dan gerbang utama.

B. *The Auditorium*

Merupakan area bagi para penonton yang terbagi dalam beberapa format

C. *The Stages*

Merupakan area bagi para penampil untuk menampilkan karya mereka

37 Chiarra, Joseph de. 1983. TIme Saver Standards for Building Types 2nd Edition . Singapore: Singapore National Printers, Ltd. p.377-378

D. *The Backstage Area*

Merupakan area persiapan bagi para penampil sebelum menampilkan karya mereka

E. *The Dressing Rooms*

Merupakan ruang ganti pakaian untuk para penampil, bisa juga dikombinasikan dengan ruang tunggu sebelum penampil mempersiapkan diri di ruang *backstage*.

F. *Shops and Offices*

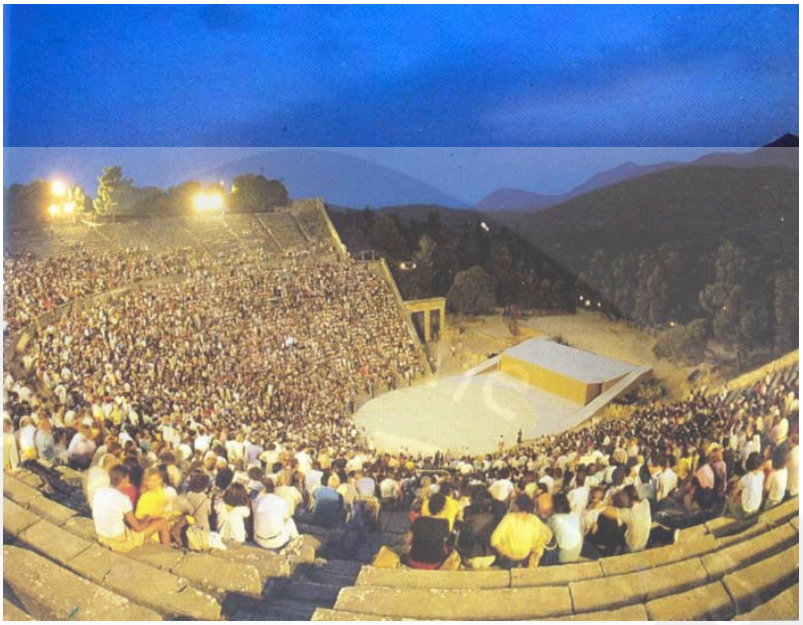
Merupakan ruang komersil pada bangunan untuk keperluan merchandise maupun urusan administrasi bangunan.

2.4 Studi Preseden

2.4.1 Hellenistic Theater of Epidaurus

Menurut (Declerq dan Dekeyer 2007) p.2011 *The Hellenistic theater of Epidaurus, on the Peloponnese in Greece, attracts thousands of visitors every year who are all amazed by the fact that sound coming from the middle of the theater reaches the outer seats, apparently without too much loss of intensity* [38]. Hellenistic theater di Epidaurus mampu menarik perhatian pengunjung tiap tahun karena terkesima dengan fakta bahwa suara yang datang dari tengah teater dapat mencapai tempat duduk paling luar tanpa kehilangan banyak intensitas.

38 Declerq, Nico F., dan Cindy S. A. Dekeyer. 2007. "The Journal of the Acoustical Society of America." Acoustic diffraction effects at the Hellenistic amphitheater of Epidaurus: Seat rows responsible for the marvelous acoustics 2011-2022. p.2011



Gambar 2. 36 Hellenistic Theater di Epidaurus
Sumber : http://www.j-g.gr/wp-content/gallery/epidaurus-festival/epidaurusfestival-5.jpg

Kualitas akustik yang ada pada teater dipengaruhi oleh geometri. Menurut (Declerq dan Dekeyer 2007) p.2012 *geometrical properties of the theater that are important for the acoustics. The theater is almost semicircular. This means that the acoustics, for a sound source situated at the center of the theater, will have a circular symmetry similar to the theater itself* [39]. Kondisi geometri dari teater penting untuk akustik. Teater berbentuk hampir setengah lingkaran. Kondisi ini menyatakan bahwa sistem akustik, untuk sumber suara di tengah teater akan memiliki simetri lingkaran mirip dengan bentuk teater itu sendiri.

39 Declerq, Nico F., dan Cindy S. A. Dekeyer. 2007. "The Journal of the Acoustical Society of America." Acoustic diffraction effects at the Hellenistic amphitheater of Epidaurus: Seat rows responsible for the marvelous acoustics 2011-2022. p.2012

Gambar 2. 37 Kondisi Geometri Lingkaran Hellenistic Theater
Sumber : http://images.fineartamerica.com/images-medium-large-5/amphitheatre-at-epidaurus-2-deborah-smolinske.jpg

Kondisi permukaan tempat duduk juga mempengaruhi kualitas akustik dengan sistem perangkap akustik alami. Menurut (Chao 2007) *The corrugations on the surface of the seats act as natural acoustic traps. Though this effect would seem to also remove the low frequencies from the actors' voices, listeners actually fill in the missing portion of the audio spectrum through a phenomenon known as virtual pitch. The human brain reconstructs the missing frequencies, producing the virtual pitch phenomenon, as in listening to someone speaking on a telephone with no low end*. Kondisi tempat duduk menjadi perangkap akustik alami walaupun kondisi tempat duduk juga mengakibatkan sumber suara kehilangan beberapa frekuensi. Kondisi kehilangan frekuensi tersebut sebenarnya mampu diolah oleh otak manusia karena kondisi kehilangan frekuensi tersebut sama dengan frekuensi suara yang biasa kita dengar melalui telepon.

Gambar 2. 38 Kondisi Tempat Duduk Hellenistic Theater
Sumber : https://upload.wikimedia.org/wikipedia/commons/d/d7/07 Epidaurus_Theater09.jpg

2.4.2 Amphiteater Taman Budaya Yogyakarta

Taman Budaya Yogyakarta yang memiliki visi sebagai "The Window of Yogyakarta" merupakan kompleks pusat pengembangan kebudayaan daerah Yogyakarta di bawah Dinas Kebudayaan dan Pariwisata Provinsi DIY. Saat ini TBY menjadi tempat dilangsungkan aneka kegiatan seni budaya (teater, musik, tari, pameran), hingga bimbingan dan pelatihan seni untuk anak dan remaja. Selain memiliki gedung pertunjukan, gedung pameran dan amphiteater, di kompleks TBY juga terdapat kantin, mushola dan perpustakaan.

Amphiteater TBY memiliki geometri persegi panjang dengan tempat duduk penontong bertingkat menghadap ke arah panggung. Amphiteater TBY memiliki atap yang disambungkan dengan konstruksi *space frame*. Sistem suara di Amphiteater TBY menggunakan *sound system* temporer menyesuaikan kebutuhan akustik tiap acara yang berlaangsung.

Amphiteater TBY memiliki masalah pada sistem *sound* di mana posisi *foh* kerap kali terletak di antara penonton sehingga menimbulkan kesulitan ketika beberapa kelompok musik memiliki *soundman* sendiri. Proses pergantian operator di amphiteater TBY kurang mengakomodasi ruang gerak sehingga terkadang beberapa *soundman* hanya mengikuti

pengaturan akustik pada operator yang kerap kali belum mengenal karakteristik suara dari kelompok musik yang terkait.

Kondisi latar panggung di Amphiteater TBY dirancang sederhana dengan pemberian batu alam yang disusun sejajar. Panggung tersebut terkadang memerlukan tambahan cahaya buatan. Lampu sebagai cahaya buatan yang terdapat pada Amphiteater TBY sulit dijangkau dalam proses pengolahan tata cahaya sehingga kondisi tata cahaya dalam beberapa konser kerap kali mengalami kemonotonan visual.

Gambar 2. 39 Amphiteater TBY
Sumber : http://www.thewindowofyogyakarta.com/images/frontpage/5.jpg